

SAILOR 900 VSAT System



SAILOR 900 VSAT

Training, installation and service manual

Document number: 98-133966-E2

Release date: 11 December 2012

Disclaimer

Any responsibility or liability for loss or damage in connection with the use of this product and the accompanying documentation is disclaimed by Thrane & Thrane. The information in this manual is provided for information purposes only, is subject to change without notice and may contain errors or inaccuracies.

Manuals issued by Thrane & Thrane are periodically revised and updated. Anyone relying on this information should acquire the most current version e.g. from <http://www.thrane.com> or from the distributor. Thrane & Thrane is not responsible for the content or accuracy of any translations or reproductions, in whole or in part, of this manual from any other source.

Copyright © 2012 Thrane & Thrane A/S. All rights reserved.

Trademark acknowledgements

- **Thrane & Thrane** is a registered trademark of Thrane & Thrane A/S in the European Union and the United States.
- **SAILOR** is a registered trademark of Thrane & Thrane A/S in the European Union and the United States.
- **Windows** is a registered trademark of Microsoft Corporation in the United States and other countries.
- Other product and company names mentioned in this manual may be trademarks or trade names of their respective owners.

GPL notification

The software included in this product contains copyrighted software that is licensed under the GPL/LGPL. The verbatim licenses can be found online at:

<http://www.gnu.org/licenses/old-licenses/gpl-2.0.html>

<http://www.gnu.org/licenses/old-licenses/lgpl-2.1.html>

You may obtain the complete corresponding source code from us for a period of three years after our last shipment of this product, which will be no earlier than 2021, by sending a money order or check for DKK 50 to:

SW Technology/GPL Compliance,
Thrane & Thrane A/S,
Lundtoftegaardsvej 93D
2800 Lyngby
DENMARK

Please write "source for product SAILOR 900 VSAT" in the memo line of your payment. You may also find a copy of the source at <http://www.thrane.com/foss>. This offer is valid to anyone in receipt of this information.

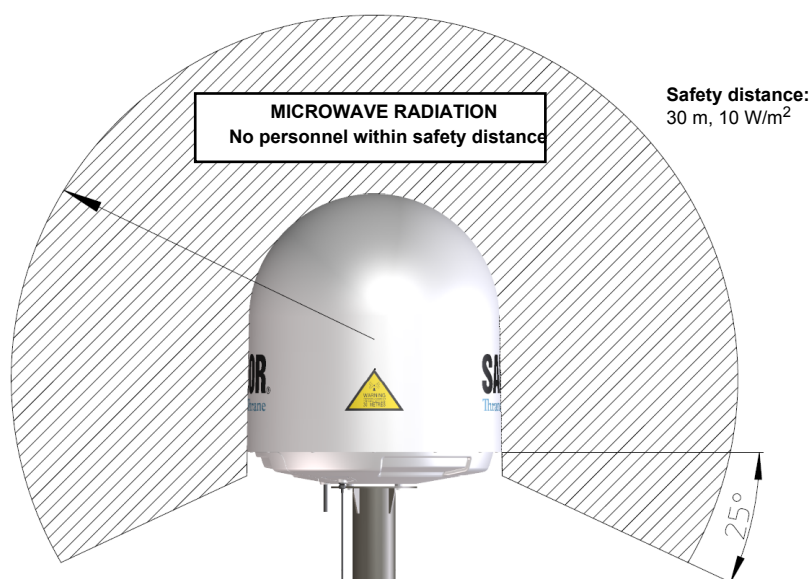
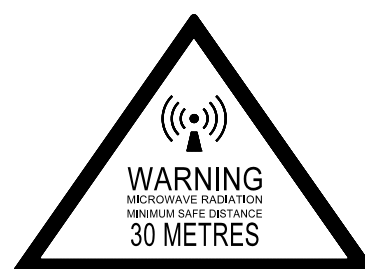
Safety summary

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment. Thrane & Thrane A/S assumes no liability for the customer's failure to comply with these requirements.

Microwave radiation hazards

During transmission the Above Deck Unit (antenna) in this system radiates Microwave Power. This radiation may be hazardous to humans close to the Above Deck Unit. During transmission, make sure that nobody gets closer than the recommended minimum safety distance.

The minimum safety distance to the Above Deck Unit reflector on the focal line is 30 m, based on a radiation level of 10 W/m^2 . No hazard exists $>25^\circ$ below the Above Deck Unit's mounting plane. Refer to the drawing below.



No-transmit zones

In order to protect personnel no-transmit zones can be programmed. For further information see *Blocking zones – azimuth and elevation* on page 3-5.

Distance to other equipment

Do not move the Above Deck Unit closer to radars than the minimum safe distance specified in section *Interference* on page 3-13 – it may cause damage to the Above Deck Unit.

Compass Safe Distance:

SAILOR 900 VSAT antenna or ADU (Above Deck Unit): min. 130 cm (IEC 945).

SAILOR 900 VSAT ACU (Antenna Control Unit): min. 10 cm (IEC 945)

Service

User access to the interior of the ACU is prohibited. Only a technician authorized by Thrane & Thrane A/S may perform service - failure to comply with this rule will void the warranty. Access to the interior of the Above Deck Unit is allowed. Replacement of certain modules - as described in *Service & maintenance* on page 9-1 and general service may only be performed by a technician authorized by Thrane & Thrane A/S.

Do not service or adjust alone

Do not attempt internal service or adjustments unless another person, capable of rendering first aid resuscitation, is present.

Grounding, cables and connections

To minimize shock hazard and to protect against lightning, the equipment chassis and cabinet must be connected to an electrical ground. The ACU must be grounded to the ship. For further grounding information refer to the Installation manual.

Do not extend the cables beyond the lengths specified for the equipment. The cable between the ACU and Above Deck Unit can be extended if it complies with the specified data concerning cable losses etc.

Rx and Tx cables for the SAILOR 900 VSAT system are shielded and should not be affected by magnetic fields. However, try to avoid running cables parallel to high power and AC/RF wiring as it might cause malfunction of the equipment.

Power supply

The voltage range for the SAILOR 900 VSAT is 20 – 32 VDC. Note that the Above Deck Unit is powered by the ACU.

If a 24 VDC power bus is not available, an external 115/230 VAC to 28 VDC power supply can be used, for example a SAILOR 6080 Power Supply.

Do not operate in an explosive atmosphere

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

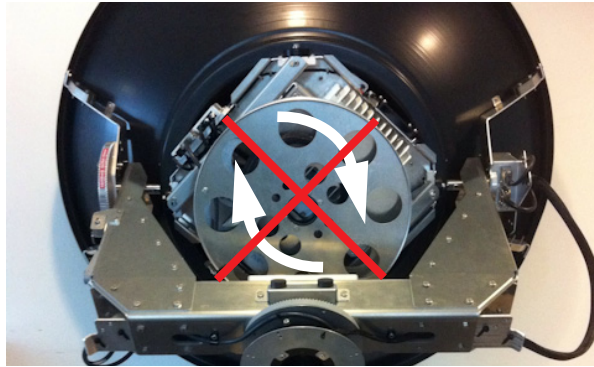
Keep away from live circuits

Operating personnel must not remove equipment covers. Component replacement and internal adjustment must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

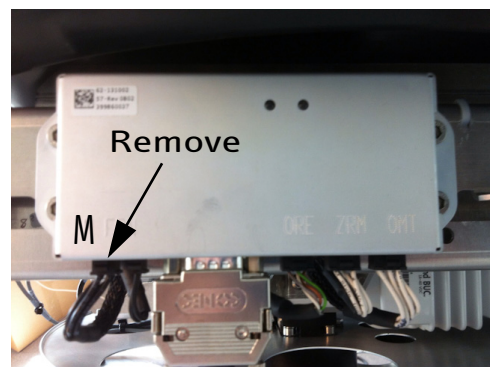
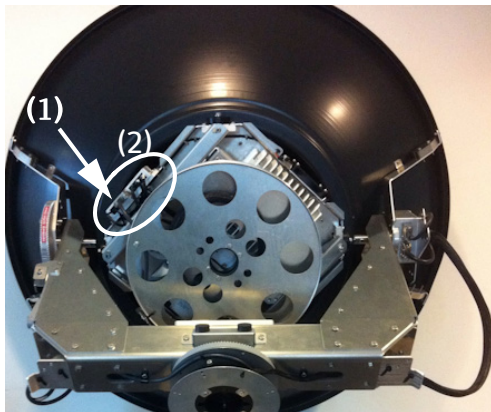
Failure to comply with the rules above will void the warranty!



CAUTION! Do not manually turn the Polarisation Unit of the antenna, it may cause damage to the antenna.



If needed to turn the Polarisation Unit manually, remove the connector (1) marked M of the Polarisation Motor Module (2).



VSAT restrictions

Note

There are restrictions in use of the frequency band 13.75 to 14 GHz in the following countries:

- Belgium
- Hungary
- Latvia
- Malta
- Slovakia

Contact VSAT modem provider for local setups.

Table of contents

Chapter 1	About this manual	
	1.1 Intended readers	1-1
	1.2 Manual overview	1-1
	1.3 Software version	1-2
	1.4 Related documents	1-2
	1.5 Typography	1-2
	1.6 Precautions	1-3
Chapter 2	Introduction	
	2.1 SAILOR 900 VSAT system	2-1
	2.1.1 Overview	2-1
	2.1.2 Above Deck Unit (ADU)	2-4
	2.1.3 Antenna Control Unit (ACU)	2-8
	2.1.4 VSAT Modem Unit (VMU)	2-10
	2.1.5 Satellite type approvals	2-10
	2.1.6 Power supply (optional)	2-10
	2.1.7 Service activation	2-10
	2.2 Part numbers and options	2-11
	2.2.1 Applicable Thrane & Thrane model and part numbers	2-11
	2.2.2 Options for SAILOR 900 VSAT	2-11

Chapter 3	Installation	
3.1	Unpacking	3-1
3.1.1	What's in the box	3-1
3.1.2	Initial inspection	3-2
3.1.3	Tools needed	3-3
3.2	Site preparation	3-3
3.2.1	General site considerations	3-3
3.2.2	Obstructions (ADU shadowing)	3-4
3.2.3	Blocking zones – azimuth and elevation	3-5
3.2.4	Safe access to the ADU: Radiation hazard	3-6
3.2.5	Ship motion and offset from the ship's motion centre	3-7
3.2.6	ADU mast design: Foundation and height	3-8
3.2.7	Interference	3-13
3.2.8	Other precautions	3-17
3.3	Installation of the ADU	3-18
3.3.1	Installing the ADU	3-19
3.3.2	Opening and removing the service hatch	3-22
3.3.3	Grounding the ADU	3-23
3.3.4	Alternative ADU cable	3-25
3.4	Installation of the ACU (bulkhead)	3-26
3.4.1	Installing the ACU (bulkhead)	3-26
3.4.2	Grounding the ACU (bulkhead)	3-27
3.4.3	SAILOR 900 VSAT ACU (bulkhead) with cable support	3-28
3.5	Installation of the 19" rack version of the ACU	3-30
3.5.1	Installing the 19" rack version of the ACU	3-30
3.5.2	Grounding the 19" rack version of the ACU	3-31
3.6	Installation of the VMU	3-32
3.6.1	General mounting considerations – VMU	3-32
3.7	Installing the dual-antenna mode (optional)	3-33

Chapter 4	Interfaces	
	4.1 Interfaces of the SAILOR 900 VSAT ACU	4-1
	4.1.1 ACU bulkhead – LEDs, display and keypad	4-1
	4.1.2 ACU 19” rack version – LEDs, display and keypad	4-1
	4.1.3 ACU bulkhead – Connector panel – overview	4-2
	4.1.4 ACU 19” rack version – Connector panel – overview	4-2
	4.1.5 DC Input connector	4-3
	4.1.6 ADU connector	4-4
	4.1.7 Rx/Tx connectors for VMU	4-4
	4.1.8 NMEA 0183 connector (RS-422)	4-5
	4.1.9 RS-232 and RS-422 connectors	4-6
	4.1.10 LAN1, LAN2, LAN3 and LAN4 connectors	4-7
	4.2 Interfaces of the VMU	4-9
	4.2.1 Connecting an iNFINITI® Series Satellite Router	4-9
	4.2.2 Connecting an Evolution® Satellite Router	4-10
	4.2.3 Connecting a Comtech 570 L or 625 Satellite Modem	4-10
	4.2.4 Connecting a Satlink2900 VSAT modem	4-11
	4.2.5 Connecting a Gilat SkyEdge II VSAT modem	4-12
Chapter 5	Connecting power	
	5.1 Power source	5-1
	5.2 Power cable selection	5-2
	5.2.1 Source impedance	5-2
	5.2.2 Measuring the ship source impedance	5-2
	5.2.3 Power cable recommendations	5-3
	5.3 Connecting power	5-4
	5.4 Power up	5-5
Chapter 6	Configuration	
	6.1 Introduction to the built-in web interface	6-1
	6.1.1 Overview	6-1
	6.1.2 Connecting to the web interface	6-2

6.2 Calibration of the SAILOR 900 VSAT	6-4
6.2.1 Preparing for calibration	6-4
6.2.2 Heading and calibration of azimuth and cable	6-6
6.2.3 Flow chart for azimuth and cable calibration	6-10
6.2.4 Line up procedure	6-11
6.2.5 SAILOR 900 VSAT fixed TX gain principle	6-13
6.3 Configuration with the web interface	6-14
6.3.1 Overview and navigation	6-14
6.3.2 Using the Dashboard	6-18
6.3.3 Satellite profiles and VSAT modem profiles	6-21
6.3.4 Setting up Blocking zones (RX and TX)	6-27
6.3.5 Configuring the LAN network	6-29
6.3.6 E-mail setup	6-32
6.3.7 Sending statistics reports	6-33
6.3.8 Sending a diagnostics report	6-36
6.3.9 Dual antenna mode (optional)	6-37
6.3.10 Upload	6-42
6.3.11 Administration	6-43
6.4 Keypad and menus of the ACU	6-49
6.4.1 ACU display and keypad	6-49
6.4.2 Navigating the menus	6-50
6.4.3 The menu tree	6-51
6.4.4 Adjusting brightness of the display	6-54
6.4.5 Resetting the system	6-55
6.5 SNMP support	6-55

Chapter 7	Installation check
7.1	Installation check list: Antenna7-1
7.2	Installation check list: ACU, connectors and wiring7-3
7.3	Installation check list: Functional test in harbor7-5

Chapter 8	Daily use – Quick guide
------------------	--------------------------------

Chapter 9	Service & maintenance
9.1	Getting support: Helpdesk9-2
9.1.1	Help desk and diagnostic report9-2

9.2 Software update	9-5
9.2.1 Hardware and software requirements	9-5
9.2.2 Software update (ADU and ACU)	9-5
9.2.3 Verifying the software update	9-6
9.3 Status signalling with LEDs and status messages	9-8
9.3.1 Overview	9-8
9.3.2 LEDs of the ADU modules	9-9
9.3.3 LEDs in the ACU	9-10
9.4 Removal and replacement of the ACU	9-11
9.5 Removal and replacement of ADU modules	9-12
9.5.1 Overview	9-12
9.5.2 Replacing the GPS module	9-18
9.5.3 Replacing the VSAT Interface Module (VIM)	9-21
9.5.4 Replacing the DC-Motor Driver Module (DDM)	9-24
9.5.5 Replacing the Polarisation Motor Module (PMM)	9-28
9.5.6 Replacing the Pedestal Control Module (PCM)	9-32
9.5.7 Replacing motor and encoder	9-34
9.5.8 Replacing the Drive Belts	9-55
9.5.9 Replacing the Zero Reference Module (ZRM)	9-63
9.5.10 Replacing the Inertial Sensor Module (ISM)	9-70
9.5.11 Replacing the Polarisation Unit	9-73
9.5.12 Replacing the BUC Fan	9-77
9.5.13 Replacing the Block Up Converter (BUC)	9-78
9.5.14 Replacing the Low Noise Block down converter (LNB)	9-80
9.5.15 Replacing the Ortho Mode Transducer (OMT)	9-82
9.5.16 Replacing the rotary joint	9-85
9.6 Updating VIM/PCM calibration data	9-89
9.7 Troubleshooting	9-91
9.7.1 Overview	9-91
9.7.2 Event list for troubleshooting	9-91
9.7.3 Diagnostic report for troubleshooting	9-91
9.7.4 Troubleshooting – BUC	9-92
9.7.5 Troubleshooting – LNB	9-93
9.7.6 System block diagram (ADU)	9-93

Appendix A	Technical specifications	
	A.1 SAILOR 900 VSAT system components	A-1
	A.1.1 General specifications	A-1
	A.1.2 ADU	A-2
	A.1.3 ACU	A-4
	A.1.4 Supported VSAT modems	A-5
	A.2 Outline drawings	A-6
	A.2.1 ADU	A-6
	A.2.2 ACU, bulkhead	A-7
	A.2.3 ACU, 19 inch rack	A-8
	A.2.4 N-connector interface on the ADU	A-9
	A.3 VSAT LNB Data Sheet (physical LNB)	A-10
	A.3.1 VSAT LNB user installation and configuration information	A-10
	A.4 VSAT 8 W BUC Data Sheet (Extended)	A-12
Appendix B	VMU cable specifications	
	B.1 Modem Cable Comtech Serial & RSSI TT7016A	B-2
	B.2 Modem Cable iNFINITI iDirect VSAT modem	B-3
Appendix C	VMU settings requirements	
	C.1 Open AMIP setup for iDirect INFINITI & Evolution	C-2
	C.1.1 Protocol and interfaces	C-2
	C.1.2 Sample options file	C-5
	C.1.3 Configuration examples (OpenAMIP)	C-8
	C.2 Non-Open-AMIP setup for iDirect iNFINITI 5000 & Evolution X5	C-9
	C.2.1 Protocol and interfaces	C-9
	C.2.2 Console port settings	C-10
	C.2.3 Configuration examples (Non-OpenAMIP)	C-12
	C.3 Comtech 570L, ROSS box & ACU	C-14
	C.3.1 Protocols and interfaces	C-14
	C.4 STM SatLink 2900 VSAT modem	C-15
	C.4.1 Interfaces and VSAT modem configuration	C-15
	C.4.2 ACU configuration	C-16

	C.5 Gilat SkyEdge II VSAT modem	C-17
	C.5.1 Interfaces and VSAT modem configuration	C-17
	C.5.2 ACU configuration	C-18
Appendix D	Command line interface	
	D.1 Introduction	D-1
	D.1.1 Telnet connection	D-2
	D.1.2 Help	D-2
	D.1.3 Conventions	D-3
	D.2 Supported commands	D-4
	D.2.1 config	D-4
	D.2.2 demo	D-4
	D.2.3 dual_antenna	D-5
	D.2.4 exit	D-5
	D.2.5 help	D-5
	D.2.6 modem	D-6
	D.2.7 satellite	D-6
	D.2.8 status	D-9
	D.2.9 system	D-9
	D.2.10 track	D-10
	D.2.11 zone	D-11
Appendix E	DVB-S satellites	
Appendix F	Grounding and RF protection	
	F.1 Why is grounding required?	F-1
	F.1.1 Reasons for grounding	F-1
	F.1.2 Safety	F-1
	F.1.3 ESD Protection	F-1
	F.2 Grounding Recommendations	F-2
	F.2.1 Grounding the ACU	F-2
	F.2.2 Grounding the ADU	F-3
	F.3 Alternative grounding for steel hulls	F-5
	F.3.1 Grounding the ACU	F-5
	F.3.2 Grounding the ADU	F-5

F.4	Alternative grounding for aluminum hulls	F-7
F.4.1	Grounding the ACU	F-7
F.4.2	Grounding the ADU	F-7
F.5	Alternative grounding for fibre glass hulls	F-9
F.5.1	Grounding the ACU	F-9
F.5.2	Grounding the ADU	F-10
F.6	Separate ground cable	F-11
F.6.1	Ground cable - construction	F-11
F.6.2	Ground cable - connection	F-12
F.6.3	Isolation of the ADU from the mounting base	F-12
F.7	Jumper cable for grounding	F-14
F.8	RF interference	F-15
F.8.1	Recommendations	F-15
Appendix G	System messages	
G.1	Event messages – overview	G-1
G.2	List of ADU events	G-2
G.3	List of ACU events	G-9
Appendix H	Approvals	
H.1	Satellite approvals	H-1
H.2	CE (R&TTE)	H-1
Glossary		Glossary-1
Index		Index-1

List of figures

Chapter 1 About this manual

Chapter 2 Introduction

Figure 2-1:	Above Deck Unit and Antenna Control Unit (ACU).....	2-2
Figure 2-2:	Above Deck Unit and Antenna Control Unit (ACU), 19" rack version	2-2
Figure 2-3:	Above Deck Unit (ADU)	2-4
Figure 2-4:	Above Deck Unit modules 1/2.....	2-5
Figure 2-5:	Above Deck Unit modules 2/2	2-6
Figure 2-6:	SAILOR 900 VSAT ACU, connector overview	2-8
Figure 2-7:	SAILOR 900 VSAT ACU, 19" rack version.....	2-9
Figure 2-8:	Antenna Control Unit for bulkhead installation.....	2-9
Figure 2-9:	Antenna Control Unit for 19" rack installation	2-9

Chapter 3 Installation

Figure 3-1:	Signal degradation because of obstructing objects.....	3-4
Figure 3-2:	2 blocking zones with no-transmit zones, azimuth (example)	3-5
Figure 3-3:	Blocking zone with no-transmit zones, elevation angle (example).....	3-5
Figure 3-4:	Radiation hazard, safety distance 30 m	3-6
Figure 3-5:	Maximum distance from the ship's motion centre (h max)	3-7
Figure 3-6:	ADU mast flange, top and side view.....	3-8
Figure 3-7:	ADU mast flange, recommended flatness on the mast mount plateau.....	3-8
Figure 3-8:	ADU mast flange, distance to the welded seam	3-9
Figure 3-9:	ADU, bottom view	3-9
Figure 3-10:	Free mast length and bracing for a tall mast	3-10
Figure 3-11:	Interference with the vessel's radar	3-14
Figure 3-12:	Recommended distance to transmitters (m) for frequencies below 1000 MHz	3-16
Figure 3-13:	Drain pipe with free space	3-17
Figure 3-14:	Use of strong sling with a belt and tag lines for safe hoisting	3-18
Figure 3-15:	Free space for access to the service hatch.....	3-19
Figure 3-16:	ADU installation, webbed sling attached to the 4 lifting brackets.....	3-20
Figure 3-17:	Mounting the ADU on the mast flange.....	3-20
Figure 3-18:	Connecting the ADU cable	3-21
Figure 3-19:	Opening the service hatch	3-22
Figure 3-20:	Removing the 2 split pins	3-22
Figure 3-21:	Removing the service hatch	3-23

Figure 3-22:	ADU, bolt for optimum grounding	3-24
Figure 3-23:	SAILOR 900 VSAT ACU without cable support	3-26
Figure 3-24:	ACU, connector panel.....	3-26
Figure 3-25:	SAILOR 900 VSAT ACU, bulkhead version, ground stud	3-27
Figure 3-26:	Cable relief for the ACU	3-28
Figure 3-27:	Mounting the cable relief 1/2.....	3-28
Figure 3-28:	Mounting the cable relief 2/2	3-29
Figure 3-29:	ACU, 19" rack version, On/off switch at the back.....	3-30
Figure 3-30:	ACU, LAN connector at the front: Service port.....	3-31
Figure 3-31:	ACU, 19" rack version, ground stud	3-31
Figure 3-32:	Dual mode antenna, overview	3-33
Figure 3-33:	Dual mode antenna, connecting cables (example)	3-34

Chapter 4 Interfaces

Figure 4-1:	ACU bulkhead, LEDs, display and keypad	4-1
Figure 4-2:	ACU rack version, LEDs, display and keypad	4-1
Figure 4-3:	ACU bulkhead, connector panel overview.....	4-2
Figure 4-4:	ACU rack version, connector panel overview	4-2
Figure 4-5:	DC Input connector with power cable	4-3
Figure 4-6:	LAN1 –LAN4 connectors	4-7
Figure 4-7:	Connecting an iNFINITI® Series Satellite Router	4-9
Figure 4-8:	Connecting an Evolution Satellite Router	4-10
Figure 4-9:	Connecting a Comtech 570 L or 625 Satellite Modem	4-10
Figure 4-10:	Connecting a SatLink 2900 Modem	4-11
Figure 4-11:	Connecting a Gilat SkyEdge II VSAT Modem	4-12

Chapter 5 Connecting power

Figure 5-1:	Measuring the ship source impedance	5-3
Figure 5-2:	Connecting power to DC Input.....	5-4
Figure 5-3:	ACU display after first power on (example with LAN ports 1 and 4 used)	5-5

Chapter 6 Configuration

Figure 6-1:	Configuration setup.....	6-1
Figure 6-2:	LAN connector used for configuring the SAILOR 900 VSAT	6-2
Figure 6-3:	SAILOR 900 VSAT Dashboard	6-3
Figure 6-4:	Service profile for calibration	6-5
Figure 6-5:	Web interface: SERVICE, Calibration	6-6

Figure 6-6:	Example for azimuth and cable calibration – step by step	6-10
Figure 6-7:	Web interface: SERVICE, Line up: Ready for activation	6-11
Figure 6-8:	Web interface: SERVICE, Line up: Antenna ready	6-12
Figure 6-9:	Fixed TX gain principle	6-13
Figure 6-10:	Topics in the web interface (SITE MAP)	6-14
Figure 6-11:	Sections of the web interface	6-15
Figure 6-12:	Web interface: DASHBOARD	6-18
Figure 6-13:	Web interface: SETTINGS - list of satellite profiles (example)	6-21
Figure 6-14:	Web interface: SETTINGS, Satellite profiles – new entry (example)	6-22
Figure 6-15:	Web interface: SETTINGS, VSAT modem profiles – list (example)	6-24
Figure 6-16:	Web interface: SETTINGS, VSAT modem profiles – new entry (example)	6-25
Figure 6-17:	Supported VSAT modems in software version 1.30	6-25
Figure 6-18:	Satellite profile for generic modem	6-26
Figure 6-19:	Web interface: SETTINGS, Blocking zones – azimuth and elevation	6-27
Figure 6-20:	Blocking zone, example: 315 - 45 degrees	6-28
Figure 6-21:	Blocking zone, example: 45 - 315 degrees	6-28
Figure 6-22:	Web interface: SETTINGS, Network (default settings)	6-29
Figure 6-23:	Web interface: SETTINGS, E-mail setup (example)	6-32
Figure 6-24:	Web interface: SETTINGS, Reports (example)	6-33
Figure 6-25:	Statistics – how to read data for a range	6-35
Figure 6-26:	Statistics report (example)	6-36
Figure 6-27:	Dual-antenna mode, link on DASHBOARD	6-37
Figure 6-28:	Enabling dual-antenna mode in Master ACU	6-38
Figure 6-29:	Dual-antenna mode, add Slave modem profile	6-39
Figure 6-30:	Dual-antenna mode, add Slave satellite profile	6-40
Figure 6-31:	Dual-antenna mode, Activate	6-40
Figure 6-32:	Dual-antenna mode, blocking zones – azimuth and elevation	6-41
Figure 6-33:	Dual-antenna mode, line up	6-42
Figure 6-34:	Web interface: Administration	6-43
Figure 6-35:	Web interface: Administration, change administrator logon and password	6-44
Figure 6-36:	Web interface: ADMINISTRATION, Reset administrator password	6-44
Figure 6-37:	Web interface: ADMINISTRATION, User permissions	6-45
Figure 6-38:	Web interface: Administration, Export/import configuration	6-46
Figure 6-39:	Web interface: ADMINISTRATION, Factory default	6-48
Figure 6-40:	Display (example) and keypad of the ACU	6-49
Figure 6-41:	Antenna Control Unit, menu tree	6-51
Figure 6-42:	Reset the system	6-55

Chapter 7 Installation check**Chapter 8 Daily use – Quick guide**

Figure 8-1:	SAILOR 900 VSAT Quick Guide – web interface and satellite profiles.....	8-1
Figure 8-2:	SAILOR 900 VSAT Quick Guide – Viewing system parameters.....	8-2

Chapter 9 Service & maintenance

Figure 9-1:	Web interface: HELPDESK.....	9-2
Figure 9-2:	Web interface: HELPDESK, Event list.....	9-3
Figure 9-3:	LAN connector used for configuring the SAILOR 900 VSAT	9-5
Figure 9-4:	Verifying software update	9-7
Figure 9-5:	LEDs on the ACU	9-10
Figure 9-6:	LEDs on the ACU, 19” rack version	9-10
Figure 9-7:	Removal and replacement of the ACU bulkhead	9-11
Figure 9-8:	Removal and replacement of the ACU 19” rack	9-11
Figure 9-9:	ADU modules and motor stop switch	9-12
Figure 9-10:	Service switch	9-16
Figure 9-11:	Above Deck Unit modules (continued).....	9-17
Figure 9-12:	GPS module	9-18
Figure 9-13:	Switch off the power to the antenna	9-19
Figure 9-14:	GPS module facing the service hatch.....	9-19
Figure 9-15:	Connector for GPS PCB.....	9-20
Figure 9-16:	Screws on GPS module.....	9-20
Figure 9-17:	VSAT Interface Module (VIM)	9-21
Figure 9-18:	Location of the VIM	9-21
Figure 9-19:	Replacing the VIM – remove 2 F-connectors	9-22
Figure 9-20:	Replacing the VIM – remove 2 N, 2 F, 1 SMA and 1 SUB-D connectors.....	9-22
Figure 9-21:	Replacing the VIM – remove 4 Allen screws.....	9-23
Figure 9-22:	DC-Motor Driver Module (DDM) for Cross Elevation.....	9-24
Figure 9-23:	Location of the Cross Elevation DDM	9-25
Figure 9-24:	Replacing the DDM – remove connectors.....	9-25
Figure 9-25:	Location of the Elevation DDM.....	9-26
Figure 9-26:	Elevation DDM, connectors.....	9-26
Figure 9-27:	location of the Azimuth DDM.....	9-27
Figure 9-28:	Azimuth DDM, connectors	9-28
Figure 9-29:	Polarisation Motor Module, remove connectors	9-29
Figure 9-30:	Polarisation Motor Module, remove screws.....	9-30

Figure 9-31:	Polarisation Motor Module, inserting	9-31
Figure 9-32:	Location of the PCM.....	9-32
Figure 9-33:	Removing the PCM – connectors	9-33
Figure 9-34:	Motors and encoders.....	9-34
Figure 9-35:	Location of the Elevation Motor & Encoder	9-35
Figure 9-36:	Elevation motor and encoder, loosen the belt tensioner	9-35
Figure 9-37:	Elevation Motor and Encoder, adjust belt tension	9-36
Figure 9-38:	Elevation DDM, disconnect 2 connectors.....	9-36
Figure 9-39:	Elevation motor and encoder, loosen the screws for the motor assembly.....	9-37
Figure 9-40:	Elevation motor and encoder, tighten the screws for the motor assembly	9-38
Figure 9-41:	Elevation motor and encoder, adjust belt tension	9-38
Figure 9-42:	Elevation motor and encoder, check of belt tension	9-39
Figure 9-43:	Elevation motor and encoder, loosen the belt tensioner	9-39
Figure 9-44:	Azimuth motor, remove cover	9-41
Figure 9-45:	Azimuth motor, loosen the belt tensioner	9-41
Figure 9-46:	Azimuth motor, adjust belt tension	9-42
Figure 9-47:	Azimuth DDM, disconnect connector	9-42
Figure 9-48:	Azimuth motor, loosen the screws for the motor assembly	9-43
Figure 9-49:	Azimuth motor, tighten the screws for the motor assembly.....	9-44
Figure 9-50:	Azimuth motor, adjust belt tension	9-44
Figure 9-51:	Azimuth motor, tighten the belt tensioner	9-45
Figure 9-52:	Azimuth encoder, remove cover.....	9-46
Figure 9-53:	Azimuth DDM, disconnect connector	9-46
Figure 9-54:	Azimuth encoder, remove	9-47
Figure 9-55:	Azimuth encoder, adjust belt tension.....	9-47
Figure 9-56:	Azimuth Encoder, adjust belt tension	9-48
Figure 9-57:	Azimuth motor, tighten the belt tensioner	9-48
Figure 9-58:	Replacement of X-Elevation Motor & Encoder 1	9-49
Figure 9-59:	X-Elevation Motor & Encoder – belt tension/adjustment screw	9-50
Figure 9-60:	Cross Elevation motor assembly, 4 Allen screws	9-50
Figure 9-61:	Cross Elevation motor assembly, do not tighten screws	9-51
Figure 9-62:	X-Elevation Motor & Encoder – adjust belt tension	9-51
Figure 9-63:	Belt tension in 3 positions	9-52
Figure 9-64:	Cross Elevation motor assembly, tighten screws	9-52
Figure 9-65:	Polarisation Motor, disconnecting power.....	9-53
Figure 9-66:	Polarisation Motor, removing 4x4 mm Allen screws.....	9-53
Figure 9-67:	Removing the sub-D connector of the PMM.....	9-54

Figure 9-68:	Polarisation Encoder, removing	9-54
Figure 9-69:	Location of the X Elevation Drive Belt	9-55
Figure 9-70:	Removing the cable drum	9-56
Figure 9-71:	Location of the Elevation Drive Belt	9-57
Figure 9-72:	Elevation Drive Belt	9-57
Figure 9-73:	Elevation motor and encoder, loosen the belt tensioner	9-58
Figure 9-74:	Elevation motor and encoder, adjust belt tension	9-58
Figure 9-75:	Elevation Drive Belt	9-59
Figure 9-76:	Azimuth drive modules, remove cover	9-60
Figure 9-77:	Azimuth drive belt, loosen the belt tensioner	9-61
Figure 9-78:	Azimuth drive belt, adjust belt tension	9-61
Figure 9-79:	Getting access to the azimuth drive wheel	9-62
Figure 9-80:	Azimuth Drive Belt	9-62
Figure 9-81:	Zero Reference Modules (ZRM), location	9-63
Figure 9-82:	Zero Reference Module (ZRM)	9-63
Figure 9-83:	X Elevation ZRM, disconnect connector	9-65
Figure 9-84:	X Elevation ZRM, slide out	9-65
Figure 9-85:	Elevation ZRM, disconnect connector	9-66
Figure 9-86:	Elevation ZRM, remove screws	9-67
Figure 9-87:	Azimuth ZRM, remove cover	9-68
Figure 9-88:	Azimuth ZRM, disconnect connector	9-68
Figure 9-89:	Azimuth ZRM, disconnect connector	9-69
Figure 9-90:	Polarisation ZRM, disconnecting	9-69
Figure 9-91:	Polarisation ZRM, loosen 2x4 mm Allen screws	9-70
Figure 9-92:	Inertial Sensor Module (ISM), location	9-70
Figure 9-93:	Inertial Sensor Module (ISM)	9-71
Figure 9-94:	Removing the ISM	9-72
Figure 9-95:	Removing the ISM Sub D connectors	9-72
Figure 9-96:	Removing the sub-D connector of the PMM	9-74
Figure 9-97:	Disconnecting the LNBs	9-75
Figure 9-98:	Removing the cable spool	9-75
Figure 9-99:	Disconnecting the OMT connector	9-76
Figure 9-100:	Disconnecting the OMT connector	9-76
Figure 9-101:	Removing the BUC fan	9-77
Figure 9-102:	Block Up Converter (BUC), location	9-78
Figure 9-103:	Block Up Converter (BUC)	9-78
Figure 9-104:	BUC, removing	9-79

Figure 9-105:	BUC, removing (continued).....	9-79
Figure 9-106:	Low Noise Block (LNB).....	9-80
Figure 9-107:	LNB, removing.....	9-81
Figure 9-108:	LNB, removing (continued).....	9-81
Figure 9-109:	Ortho Mode Transducer (OMT).....	9-82
Figure 9-110:	OMT, removing 2xTorx20 screws on top.....	9-83
Figure 9-111:	OMT, removing 4xTorx20 screws on the left-hand rail of the Polarisation Unit...	9-83
Figure 9-112:	OMT, removing 4xTorx20 screws on the right-hand rail of the Polarisation Unit	9-84
Figure 9-113:	OMT, removing	9-84
Figure 9-114:	OMT, removing the waveguide	9-85
Figure 9-115:	Rotary joint.....	9-85
Figure 9-116:	Azimuth motor, remove cover	9-86
Figure 9-117:	Getting access to the azimuth drive wheel	9-87
Figure 9-118:	Rotary joint (in place)	9-87
Figure 9-119:	Rotary joint (removed).....	9-88
Figure 9-120:	Updating VIM/PCM calibration data (example)	9-89
Figure 9-121:	XIM data, warning.....	9-89
Figure 9-122:	XIM data not ready.....	9-90
Figure 9-123:	XIM data valid	9-90
Figure 9-124:	Troubleshooting – BUC	9-92
Figure 9-125:	Troubleshooting – LNB.....	9-93

App. A Technical specifications

Figure A-1:	Outline drawing: ADU	A-6
Figure A-2:	Outline drawing: ACU, bulkhead.....	A-7
Figure A-3:	Outline drawing: ACU, 19 inch rack	A-8
Figure A-4:	N-Connector interface on the ADU.....	A-9

App. B VMU cable specifications

Figure B-1:	Modem Cable Comtech Serial & RSSI TT7016A	B-2
Figure B-2:	Modem Cable iNFINITI iDirect VSAT modem	B-3

App. C VMU settings requirements

Figure C-1:	Connecting iDirect iNFINITI 5000 series to the ACU (OpenAMIP)	C-3
Figure C-2:	Connecting iDirect Evolution X5 to the ACU (OpenAMIP)	C-3
Figure C-3:	Supported OpenAMIP commands	C-4
Figure C-4:	VSAT modem profile, OpenAMIP (example)	C-8

Figure C-5:	Satellite profile, OpenAMIP (example)	C-8
Figure C-6:	Connecting iDirect iNFINITI 5000 series to the ACU (Non-OpenAMIP)	C-9
Figure C-7:	Connecting iDirect Evolution X5 to the ACU (Non-OpenAMIP)	C-10
Figure C-8:	RS-232 Console cable for iDirect Non-OpenAMIP VSAT modem	C-10
Figure C-9:	VSAT modem profile, Non-OpenAMIP (example)	C-12
Figure C-10:	Satellite profile, Non-OpenAMIP (example)	C-13
Figure C-11:	Connecting Comtech 570L and ROSS box to the ACU (example)	C-14
Figure C-12:	Connecting SatLink 2900 VSAT modem to the ACU	C-15
Figure C-13:	Connecting Gilat SkyEdge II VSAT modem to the ACU	C-17

App. D Command line interface

Figure D-1:	How to use the command line interface (example for telnet)	D-1
Figure D-2:	Command line interface, login	D-2

App. E DVB-S satellites

Figure E-1:	Satellite data, example from www.lyngsat.com	E-2
-------------	---	-----

App. F Grounding and RF protection

Figure F-1:	Extending the ground plane	F-3
Figure F-2:	Grounding the ADU	F-3
Figure F-3:	Grounding at a dedicated RF ground (alternative)	F-6
Figure F-4:	Alternative grounding for aluminium hulls	F-8
Figure F-5:	Alternative grounding for fibreglass hulls	F-10
Figure F-6:	Separate ground cable	F-11
Figure F-7:	Isolation of the ADU from the mounting base	F-12
Figure F-8:	ADU isolation and grounding cable	F-13
Figure F-9:	Jumper cable for grounding (specifications)	F-14

App. G System messages

App. H Approvals

List of tables

Chapter 1 About this manual

Table 1-1:	List of Related Documents	1-2
------------	---------------------------------	-----

Chapter 2 Introduction

Table 2-1:	Model and part numbers for the SAILOR 900 VSAT system (T&T units).....	2-11
Table 2-2:	Model and part numbers for options of the SAILOR 900 VSAT system	2-11

Chapter 3 Installation

Table 3-1:	Maximum distance from the ship's motion center versus ship's roll period.....	3-7
Table 3-2:	Mast dimensions without braces	3-11
Table 3-3:	Mast dimensions with 3 braces.....	3-11
Table 3-4:	Mast dimensions with 2 braces.....	3-12
Table 3-5:	Minimum radar separation, X-band	3-14
Table 3-6:	Minimum radar separation, S-band.....	3-15
Table 3-7:	ADU cable types and maximum lengths.....	3-25
Table 3-8:	Dual mode antenna, cabling.....	3-34

Chapter 4 Interfaces

Table 4-1:	DC Input plug, outline and pin assignment.....	4-3
Table 4-2:	N connector, outline and pin assignment	4-4
Table 4-3:	F connector, Rx and Tx, outline and pin assignment.....	4-4
Table 4-4:	NMEA 0183/2000 connector, outline and pin assignment	4-5
Table 4-5:	RS-232 connector, male, outline and pin assignment.....	4-6
Table 4-6:	RS-422 connector, male, outline and pin assignment.....	4-7
Table 4-7:	Ethernet connector, outline and pin assignment.....	4-8
Table 4-8:	Cables to connect an iNFINITI® Series Satellite Router	4-9
Table 4-9:	Cables to connect a Comtech 570 L-Band Satellite Modem	4-10
Table 4-10:	Cables to connect a SatLink 2900 VSAT modem	4-11
Table 4-11:	Cables to connect a Gilat SkyEdge VSAT modem	4-12

Chapter 5 Connecting power

Chapter 6 Configuration

Table 6-1:	Satellite requirements for elevation and carrier	6-5
Table 6-2:	Satellite identifier and NID values.....	6-8

Table 6-3:	Possible error codes during calibration	6-9
Table 6-4:	Web interface: Event icon	6-16
Table 6-5:	Web interface, DASHBOARD, SAILOR 900 VSAT parameters	6-19
Table 6-6:	Web interface, DASHBOARD, VSAT MODEM parameter.....	6-20
Table 6-7:	Web interface, DASHBOARD, POINTING parameter.....	6-20
Table 6-8:	Elevation cutoff (in degrees) versus VSAT modem bandwidth and power	6-23
Table 6-9:	Setup of LAN connectors	6-30
Table 6-10:	Statistics report, header record	6-34
Table 6-11:	Parameters recorded in a statistics report	6-34
Table 6-12:	Top-level menus of the ACU	6-52
Table 6-13:	ANTENNA menu of the ACU.....	6-52
Table 6-14:	MODEM menu of the ACU.....	6-53
Table 6-15:	NETWORK menu of the ACU	6-53
Table 6-16:	SATELLITE menu of the ACU	6-53
Table 6-17:	EVENTS menu of the ACU	6-54

Chapter 7 Installation check

Table 7-1:	Installation check list: Antenna	7-1
Table 7-2:	Installation check list: ACU, connectors and wiring	7-3
Table 7-3:	Installation check list: Functional test in harbour	7-5

Chapter 8 Daily use – Quick guide

Chapter 9 Service & maintenance

Table 9-1:	LEDs of the ADU modules	9-9
Table 9-2:	LEDs on the ACU	9-10

App. A Technical specifications

Table A-1:	General specifications	A-1
Table A-2:	Technical specifications for the Above Deck Unit	A-2
Table A-3:	Technical specifications for the ACU	A-4
Table A-4:	Supported VSAT modems	A-5
Table A-5:	Technical specifications for VSAT LNB	A-10
Table A-6:	4-band switching	A-11
Table A-7:	Technical specifications for VSAT 8 W BUC	A-12

App. B VMU cable specifications**App. C VMU settings requirements**

Table C-1:	Messages sent from the VSAT modem to the ACU (examples)	C-4
Table C-2:	Messages sent from the ACU to the VSAT modem (examples)	C-5
Table C-3:	Ranges for signal strength for iDirect Open AMIP VSAT modem.....	C-5
Table C-4:	Information in the VSAT modem option file	C-7
Table C-5:	Requirements for VSAT modem option file, Non-OpenAMIP	C-11
Table C-6:	Configuration of Gilat SkyEdge II VSAT modem.....	C-18

App. D Command line interface

Table D-1:	Command typography.....	D-3
Table D-2:	UCLI command: <code>config</code>	D-4
Table D-3:	UCLI command: <code>demo</code>	D-4
Table D-4:	UCLI command: <code>dual_antenna</code>	D-5
Table D-5:	UCLI command: <code>exit</code>	D-5
Table D-6:	UCLI command: <code>help</code>	D-5
Table D-7:	UCLI command: <code>modem</code>	D-6
Table D-8:	UCLI command: <code>satellite</code>	D-6
Table D-9:	UCLI command: <code>status</code>	D-9
Table D-10:	UCLI command: <code>system</code>	D-9
Table D-11:	UCLI command: <code>track</code>	D-10
Table D-12:	UCLI command: <code>zone</code>	D-11

App. E DVB-S satellites

Table E-1:	Examples of DVB-S satellites for azimuth calibration	E-1
------------	--	-----

App. F Grounding and RF protection**App. G System messages**

Table G-1:	ADU event messages	G-2
Table G-2:	ACU event messages	G-9

App. H Approvals

About this manual

1.1 Intended readers

This is an installation and user manual for the SAILOR 900 VSAT system, intended for installers of the system and service personnel. Personnel installing or servicing the system must be properly trained and authorized by Thrane & Thrane. It is important that you observe all safety requirements listed in the beginning of this manual, and install the system according to the guidelines in this manual. For daily use of the SAILOR 900 VSAT system see the SAILOR 900 VSAT Quick guide or *Daily use – Quick guide* on page 8-1.

1.2 Manual overview

This manual has the following chapters:

- *Introduction*
- *Installation*
- *Interfaces*
- *Connecting power*
- *Configuration*
- *Installation check*
- *Daily use – Quick guide*
- *Service & maintenance*

This manual has the following appendices:

- *Technical specifications*
- *VMU cable specifications*
- *VMU settings requirements*
- *Command line interface*
- *DVB-S satellites*
- *Grounding and RF protection*
- *System messages*
- *Approvals*

1.3 Software version

This manual is intended for SAILOR 900 VSAT with **software version 1.30**.

1.4 Related documents

The following related documentation is referred to in this manual:

Document number	Title
98-133401	SAILOR 900 VSAT Quick guide
98-133400	Installation and user manual

Table 1-1: List of Related Documents

1.5 Typography

In this manual, typography is used as indicated below:

Bold is used for the following purposes:

- To emphasize words.
Example: “Do **not** touch the antenna”.
- To indicate what the user should select in the user interface.
Example: “Select **SETTINGS** > **LAN**”.

Italic is used to emphasize the paragraph title in cross-references.

Example: “For further information, see *Connecting Cables* on page...”.

1.6 Precautions

1.6.0.1 Warnings, Cautions and Notes

Text marked with “Warning”, “Caution”, “Note” or “Important” show the following type of data:

- **Warning:** A Warning is an operation or maintenance procedure that, if not obeyed, can cause injury or death.
- **Caution:** A Caution is an operation or maintenance procedure that, if not obeyed, can cause damage to the equipment.
- **Note:** A Note gives information to help the reader.
- **Important:** A text marked Important gives information that is important to the user, e.g. to make the system work properly. This text does not concern damage on equipment or personal safety.

1.6.0.2 General precautions

All personnel who operate equipment or do maintenance as specified in this manual must know and follow the safety precautions.

The warnings and cautions that follow apply to all parts of this manual.



WARNING! Before using any material, refer to the manufacturers' material safety data sheets for safety information. Some materials can be dangerous.



CAUTION! Do not use materials that are not equivalent to materials specified by Thrane & Thrane. Materials that are not equivalent can cause damage to the equipment.



CAUTION! The system contains items that are electrostatic discharge sensitive. Use approved industry precautions to keep the risk of damage to a minimum when you touch, remove or insert parts or assemblies.

Introduction

This chapter is organised in the following sections:

- *SAILOR 900 VSAT system*
- *Part numbers and options*

2.1 SAILOR 900 VSAT system

2.1.1 Overview

The SAILOR 900 VSAT is a unique stabilized maritime VSAT antenna system operating in the Ku-band (10.7 to 14.5 GHz). It provides bi-directional IP data connections both on regional satellite beams and quasi-global Ku-band satellite networks. The system only requires a single 50 Ohm cable to provide the Above Deck Unit with both DC power, data and control information. The radome does not have to be removed neither before nor after the installation. To protect the Above Deck Unit the built-in DC motors act as breaks during transport and when the Above Deck Unit is not powered. The ADU system can be accessed remotely and in-depth performance analysis can be done using the built-in web interface.

The SAILOR 900 VSAT system consists of two units:

- Above Deck Unit (ADU)
- Antenna Control Unit (ACU)

The following figures show the SAILOR 900 VSAT system with its two variants of ACUs.



Figure 2-1: Above Deck Unit and Antenna Control Unit (ACU)



Figure 2-2: Above Deck Unit and Antenna Control Unit (ACU), 19" rack version

2.1.1.1 SAILOR 900 VSAT features

- Single 50 Ohm coax cable for the ADU.
- Support of several VSAT modems.
- Dual antenna mode¹.
- SNMP support.
- Service communication using SAILOR FleetBroadband over WAN.
- Remote or local simultaneous software update of ADU and ACU via PC and Internet browser.
- Global RF configuration.
- Full remote control and troubleshooting with built-in test equipment (BITE).
- ACU with 4 x LAN, NMEA 0183, NMEA 2000, RS-232 and RS-422.
- All interfaces at the ACU, no additional units required.
- DC powered. Start up voltage: 22 VDC guaranteed, operating range: 20 – 32 VDC.
- No scheduled maintenance.

1. Patent pending.

2.1.2 Above Deck Unit (ADU)

The SAILOR 900 VSAT ADU is a 103 cm VSAT stabilised tracking antenna, consisting of a suspended antenna with a standard global RF configuration. The ADU's weight is 135 kg. It is stabilized by heavy duty vibration dampers in 3-axis (plus skew) and can be used in environments with elevations of -25° to $+125^{\circ}$. The ADU is powered by the ACU and protected by a radome.



Figure 2-3: Above Deck Unit (ADU)

2.1.2.1 Modules in the SAILOR 900 VSAT ADU

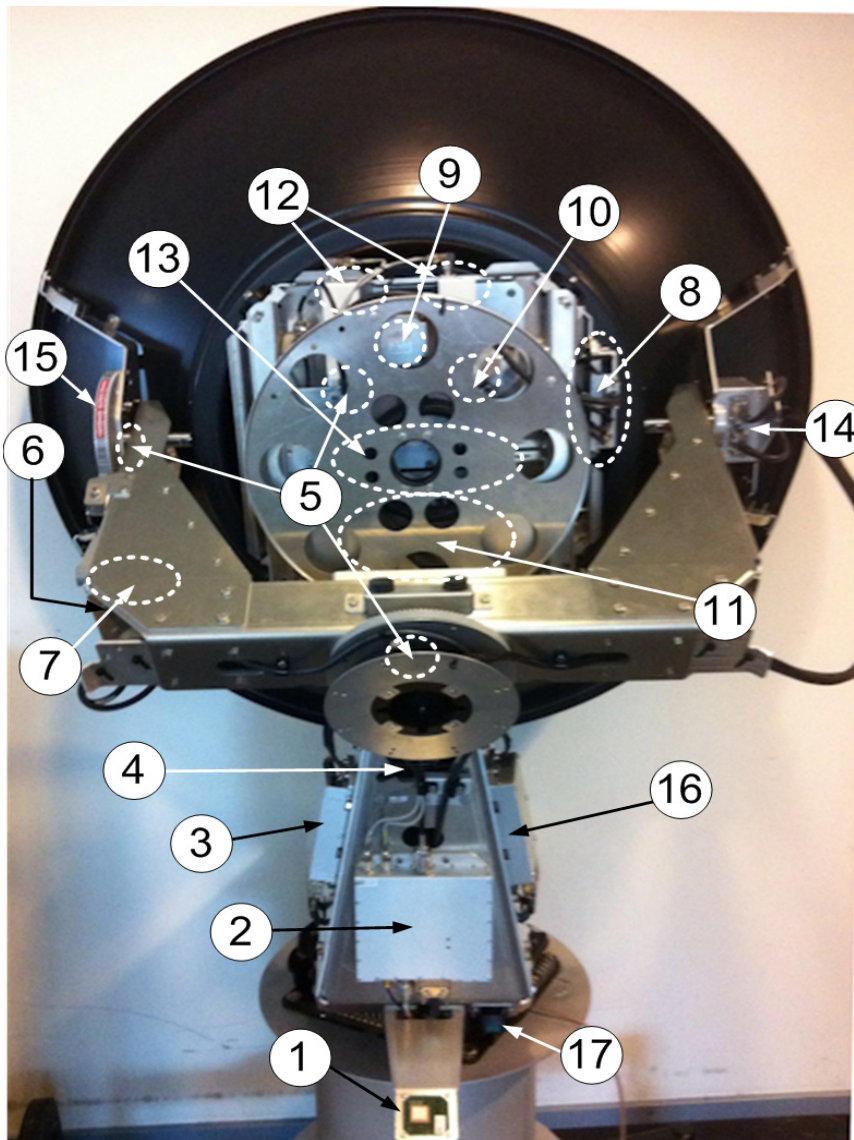


Figure 2-4: Above Deck Unit modules 1/2

1. GPS module.
2. VSAT Interface Module (VIM).
3. DC-Motor Driver Module for cross elevation (DDM).
4. Cross elevation motor and encoder.
5. Zero Reference Module (x4) (ZRM) (not visible on photo).
6. DC-Motor Driver Module for elevation (on the bottom) (DDM).
7. Elevation motor and encoder (not visible).
8. Polarisation Motor Module (PMM).

9. Polarisation motor.
10. Polarisation encoder (not visible on photo).
11. Block Up Converter (BUC). (behind cable screen, not visible on photo)
12. Low Noise Block downconverter (x2) (LNB).
13. Ortho Mode Transducer (OMT). (not visible on photo)
14. Inertial Sensor Module (ISM).
15. Elevation locking pin to lock the antenna dish in a fixed position.
16. Pedestal Control Module (PCM).
17. Service switch.

In switch-off position the DC Motor Driver modules and the BUC are turned off for safe conditions during service and repair. The switch must be in on position for normal ADU operation.

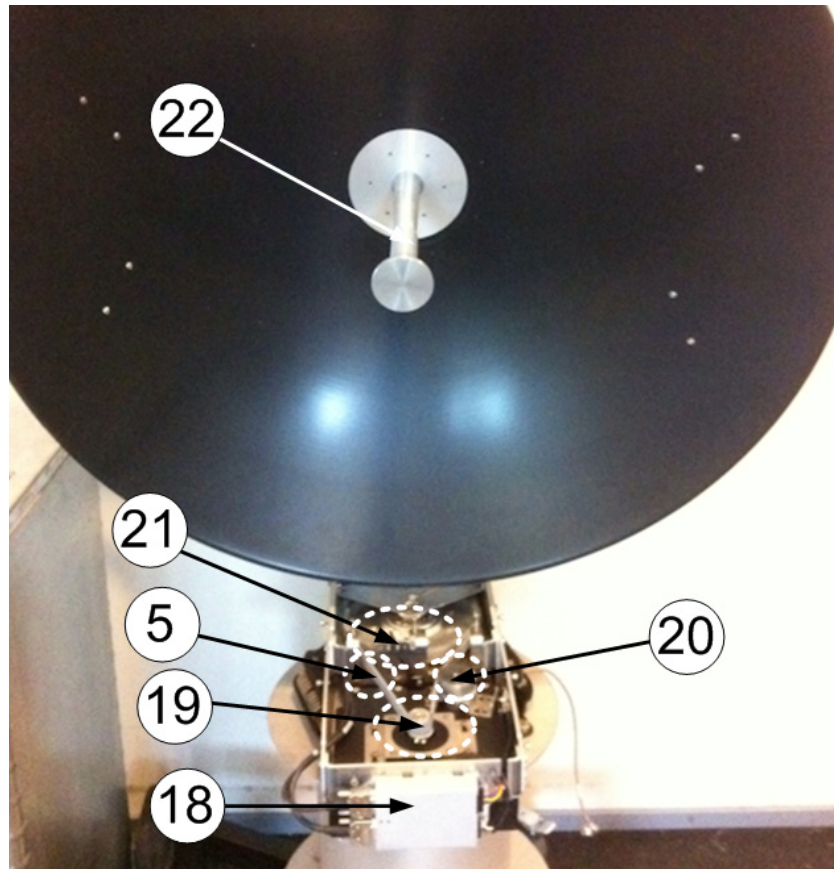


Figure 2-5: Above Deck Unit modules 2/2

18. DC-Motor Driver Module for Azimuth (DDM).
19. Azimuth motor.
20. Azimuth encoder.

21. Rotary joint.

22. Feed horn.

See *Overview* on page 9-12 in the chapter *Service & maintenance* for a more detailed description of the modules.

2.1.2.2 SAILOR 900 VSAT ADU interface

All communication between the ADU and the ACU passes through a single standard 50 Ohm cable (with N connector) through the rotary joint. No cable work is required inside the radome.

2.1.2.3 Installation friendly

Four lifting brackets (included in the delivery) and reuse of packing material help getting the ADU safely into place. Satellite profile parameters are entered using the built-in web server of the ACU, using a PC.

The included cable relief support can be attached to the ACU.

2.1.2.4 Service friendly

The system configuration is saved in two modules, there is no loss of data at repair. The large service hatch of the radome gives easy access to the ADU on site. The service switch in the ADU stops the DC Motor Driver modules and turns the BUC off. The service tools for replacing modules are placed on a tool holder inside the radome.

All modules have a service and power LED status indicator. Each module is encapsulated in a metal box with self-contained mounting bolts.

If necessary, belts and modules can be exchanged through the service hatch on site.

You can do remote diagnostics and service with the ADU. Its built-in test equipment checks constantly the ADU's components for proper functioning, it monitors and logs information for all modules. The ADU performs a POST (Power On Self Test) and you can request a self test (Person Activated Self Test) and Continuous Monitoring (CM). Error codes can be read out in the web interface and in the display of the ACU.

ADU software is updated automatically when making a software update of the ACU.

2.1.3 Antenna Control Unit (ACU)

The ACU is the central unit in the system. It contains all user interfaces and manages all communication between the ADU and connected the VMU, a connected PC and an optional FleetBroadband service communication line. The ACU has a display, status LEDs and a keypad. It provides a DHCP client. During configuration you can configure heading offset, save satellite and VMU setups and enter *No Transmit Zones* (blocking zones in which the ADU does not transmit).

The ACU provides DC power to the ADU through a single coaxial cable. You can use the SAILOR 6080 Power Supply to provide the DC power for the ACU.

2.1.3.1 ACU interfaces

The ACU has the following interfaces and switch:

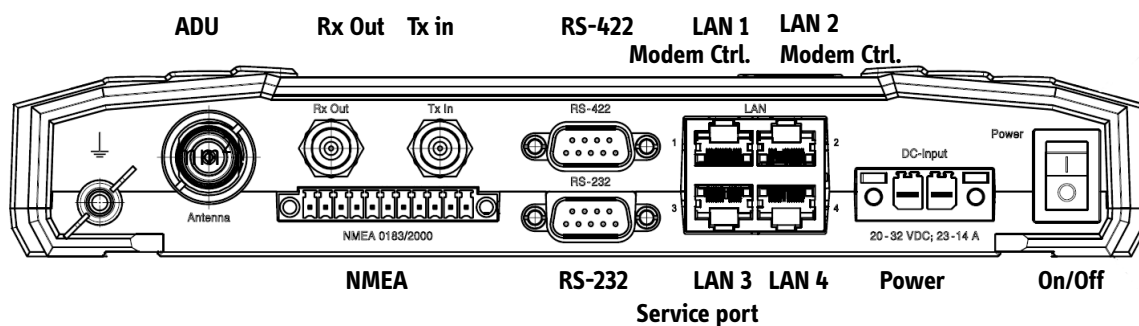


Figure 2-6: SAILOR 900 VSAT ACU, connector overview

- N-connector for ADU cable (50 Ohm).
- 2 x F connectors for Rx and Tx cables (75 Ohm) to VSAT modem.
- Multi connector for NMEA interfaces (for input from GPS compass or Gyro compass).
- RS-422 interface for modem control.
- RS-232 interface for modem control.
- 4 x LAN ports for VSAT modem control and user equipment (i.e. for SAILOR FleetBroadband service communication line or WAN port for VSAT Internet).
- Power connector.
- On/Off power switch

The 19" rack version of the ACU has additionally a LAN connector at the front for accessing the service port from the ACU front panel.



Figure 2-7: SAILOR 900 VSAT ACU, 19" rack version

2.1.3.2 Installation friendly

The ACU comes in two models: Wall or desktop installation (bulkhead) or in a 19" rack version.

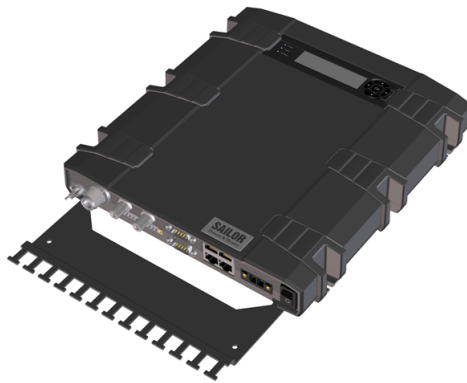


Figure 2-8: Antenna Control Unit for bulkhead installation



Figure 2-9: Antenna Control Unit for 19" rack installation

2.1.3.3 Service friendly

You can do remote diagnostics and service with the ACU. Its built-in test equipment checks constantly the ACU's modules for proper functioning, it monitors and logs for all modules. It performs POST (Power On Self Test) and you can request a PAST (Person Activated Self Test). Continuous Monitoring (CM) is also available. BITE error codes can be read out in the web interface and in the display of the ACU.

Software update is done via a connected PC and the built-in web interface of the ACU.

2.1.4 VSAT Modem Unit (VMU)

SAILOR 900 VSAT is designed to be operated with third-party VSAT modems. For a list of supported VSAT modems see the SAILOR 900 VSAT data sheet at thrane.com.

2.1.5 Satellite type approvals

For a list of satellite type approvals see the SAILOR 900 VSAT data sheet at thrane.com.

2.1.6 Power supply (optional)

Use the SAILOR 6080 Power Supply to provide DC power to the SAILOR 900 VSAT.

2.1.7 Service activation

Before you can start using the SAILOR 900 VSAT, you need to activate the system for VSAT service. Contact your service provider for activation.

2.2 Part numbers and options

2.2.1 Applicable Thrane & Thrane model and part numbers

The following model and part numbers are available for the SAILOR 900 VSAT system:

T&T part number	Model number	Description
407009A-00500	TT-7009A-THR	SAILOR 900 VSAT Above Deck Unit (ADU)
407016A-00500	TT-7016A-T19	SAILOR 900 VSAT Antenna Control Unit (19 inch rack)
407016A-00510	TT-7016A-TBH	SAILOR 900 VSAT Antenna Control Unit (bulkhead)

Table 2-1: Model and part numbers for the SAILOR 900 VSAT system (T&T units)

2.2.2 Options for SAILOR 900 VSAT

The following options are available for the SAILOR 900 VSAT system:

Part number	Description
406080A-00500	Power Supply
407090A-950	Antenna cable 50 m, N-Conn (not mounted), male/male
407090A-925	Pigtail Cable 1.25 m, N-Conn, female/male
–	Accessory kit for dual antenna mode

Table 2-2: Model and part numbers for options of the SAILOR 900 VSAT system

Installation

This chapter is organised in the following sections:

- *Unpacking*
- *Site preparation*
- *Installation of the ADU*
- *Installation of the ACU (bulkhead)*
- *Installation of the 19" rack version of the ACU*
- *Installation of the VMU*

3.1 Unpacking

3.1.1 What's in the box

3.1.1.1 ADU

Unpack your SAILOR 900 VSAT ADU and check that the following items are present:

- ADU with 4 lifting brackets (already mounted)
- Package with bolts, washers and cable glands (2 sizes)

3.1.1.2 ACU (bulkhead)

Unpack your SAILOR 900 VSAT ACU (bulkhead) and check that the following items are present:

- 1 x Ethernet cable (2 m)
- Power connector
- 2 x 75 Ohm coax cables F-F (1m), for Rx and Tx
- NMEA multi-connector
- Installation manual (this manual)
- Quick guide
- Cable relief

3.1.1.3 ACU (19" rack version)

Unpack your SAILOR 900 VSAT ACU (19" rack version) and check that the following items are present:

- 1 x Ethernet cable (2 m)
- 1 x Ethernet cable (short)
- Power connector
- 2 x 75 Ohm coax cables F-F (1m), for Rx and Tx
- NMEA multi-connector
- Installation manual (this manual)
- Quick guide

3.1.2 Initial inspection

Inspect the shipping cartons and wooden box immediately upon receipt for evidence of damage during transport. If the shipping material is severely damaged or water stained, request that the carrier's agent be present when opening the cartons and wooden box. Save all box packing material for future use.



WARNING! To avoid electric shock, do not apply power to the system if there is any sign of shipping damage to any part of the front or rear panel or the outer cover. Read the safety summary at the front of this manual before installing or operating the system.

After unpacking the system, i.e. removing the top and sides of the wooden box and opening the cartons, inspect it thoroughly for hidden damage and loose components or fittings. If the contents are incomplete, if there is mechanical damage or defect, or if the system does not work properly, notify your dealer.

3.1.3 Tools needed

- Unbraco key (5 mm), included, mounted on a tool holder inside the radome.

Other tools that may be needed during the installation:

- Torx TX20 to open the locks of the service hatch
- Wrench to fasten the mounting bolts for the ADU
- Wrench to fasten the N connector at the ADU
- PC and Internet browser
- Drill for the mounting holes for the ACU
- Crimping tools

For tools needed when replacing modules you find a list of tools needed for each module in the chapter *Service & maintenance*.

3.2 Site preparation

The following topics have to be considered when installing the ADU:

- *General site considerations*
- *Obstructions (ADU shadowing)*
- *Blocking zones – azimuth and elevation*
- *Safe access to the ADU: Radiation hazard*
- *Ship motion and offset from the ship's motion centre*
- *ADU mast design: Foundation and height*
- *Interference*
- *Other precautions*

3.2.1 General site considerations

For optimum system performance, some guidelines on where to install or mount the different components of the SAILOR 900 VSAT System must be followed.

It is recommended to mount the ADU in a location with as much **360° free line of sight to the satellite** as possible while making sure that the support structure fulfills the requirements for the mast foundation. The ADU must be mounted on stiffened structures with a minimum of exposure to vibrations.

3.2.2 Obstructions (ADU shadowing)

Place the ADU so that it has as much free line-of-sight without any structures in the beam through one full 360 degrees turn of the vessel. Do not place the ADU close to large objects that may block the signal. To avoid obstruction elevate the ADU by mounting it on a mast or on a mounting pedestal on a deck or deck house top.

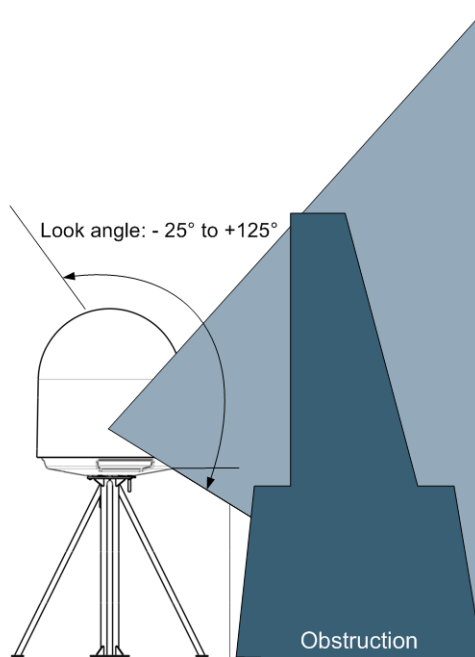


Figure 3-1: Signal degradation because of obstructing objects

The ADU is stabilized in 3-axis (plus skew) and can be used in environments with elevations of -25° to $+125^{\circ}$ to allow for continuous pointing even in heavy sea conditions.

The ADU beam is approximately 1 m in diameter for the first 30 m from the ADU. Beyond 30 m the beam gradually widens so that it is approximately 5 m in diameter at 100 m distance. This beam expansion continues with increasing distance.

Any obstructions, such as masts, funnels, bridge house etc. within this field can cause signal degradation or signal loss.

Note

Please note that due to the short wavelength at Ku band and the narrow beam width of the ADU even a **6 mm steel wire placed within 50 m** inside the beam can cause signal degradation.

3.2.3 Blocking zones – azimuth and elevation

Your installation may require that you setup blocking zones for the ADU, i.e. areas where the ADU will not transmit and areas where transmit power is potentially dangerous for persons frequently being in these zones. You can set up 8 blocking zones. Each blocking zone is set up with azimuth start and stop, and elevation angle.

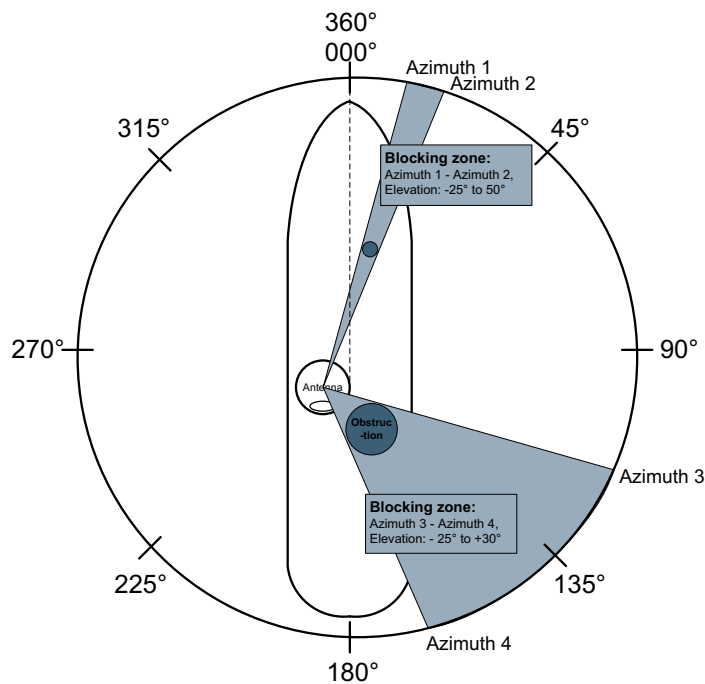


Figure 3-2: 2 blocking zones with no-transmit zones, azimuth (example)

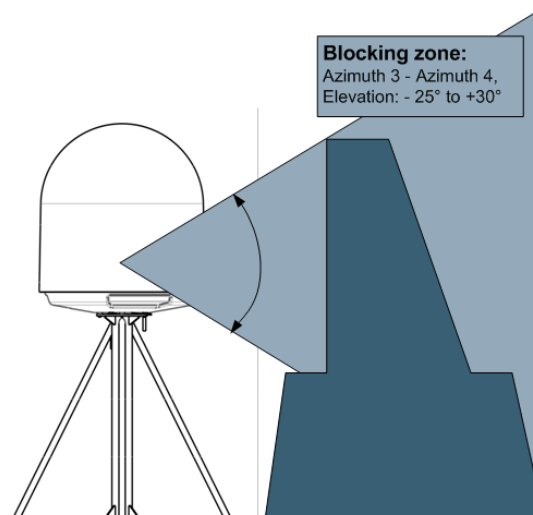


Figure 3-3: Blocking zone with no-transmit zones, elevation angle (example)

The blocking zones are set up in the SAILOR 900 VSAT built-in web interface of the ACU. For further information see *Setting up Blocking*

zones (RX and TX) on page 6-27.

3.2.4 Safe access to the ADU: Radiation hazard

The SAILOR 900 VSAT ADU radiates up to 49 dBW EIRP. This translates to a minimum safety distance of 30 m from the ADU while it is transmitting, based on a radiation level of 10 W/m^2 .

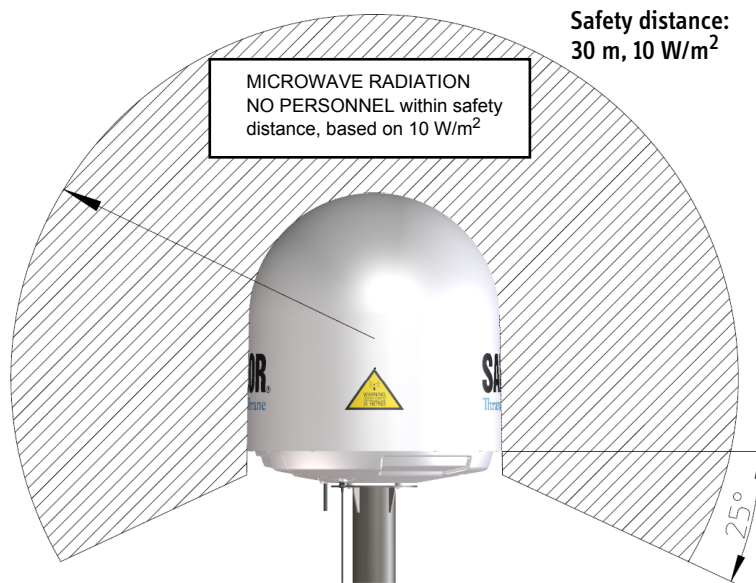


Figure 3-4: Radiation hazard, safety distance 30 m

3.2.5 Ship motion and offset from the ship's motion centre

Even though it is recommended to mount the ADU high, keep the distance between the ADU and the ship's motion centre as short as possible. The higher up the ADU is mounted, the higher is the linear g force applied to the ADU. The g force also depends on the roll period of the ship, see Table 3-1. If the g force applied is too high, performance and ADU signal stabilization may be reduced and eventually the ADU may be damaged. Refer to the following table for allowed mounting heights above the ship's motion centre.

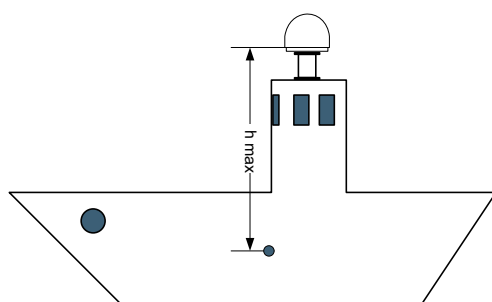


Figure 3-5: Maximum distance from the ship's motion centre (h max)

Min. roll period	Max. ADU mounting height (h max)	
	Full performance	Potential risk of damage
4 s	12 m	16 m
6 s	27 m	35 m
8 s	48 m	62 m
10 s	75 m	98 m

Table 3-1: Maximum distance from the ship's motion center versus ship's roll period

3.2.6 ADU mast design: Foundation and height

The ADU mast must be designed to carry the weight of the ADU unit, which is 135 kg (+ the weight of the mast flange). The mast must also be able to withstand on-board vibrations and wind speeds up to 110 knots on the radome, even in icing conditions.

3.2.6.1 ADU mast flange

Fit the top of the ADU mast with a flange with clearance holes matching the bushings in the radome and with minimum 4 gusset plates. No center hole is necessary in the flange.

- **Flange thickness:** Minimum 15 mm.
- **4 gusset plates:** Minimum 15 mm thick, must be placed close to the holes in the mounting plate and evenly distributed.

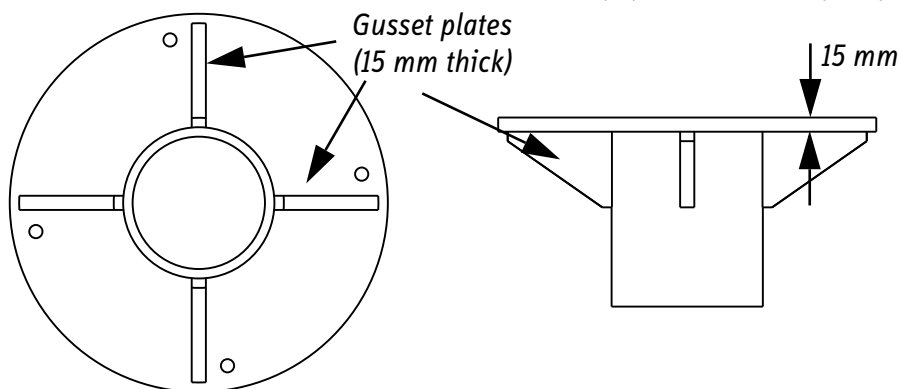


Figure 3-6: ADU mast flange, top and side view

Recommended flatness on the mast mount plateau is below 3,0 mm.

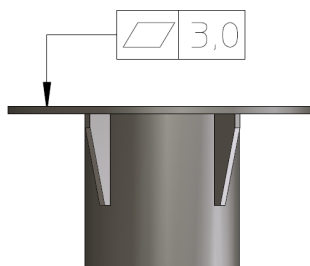


Figure 3-7: ADU mast flange, recommended flatness on the mast mount plateau

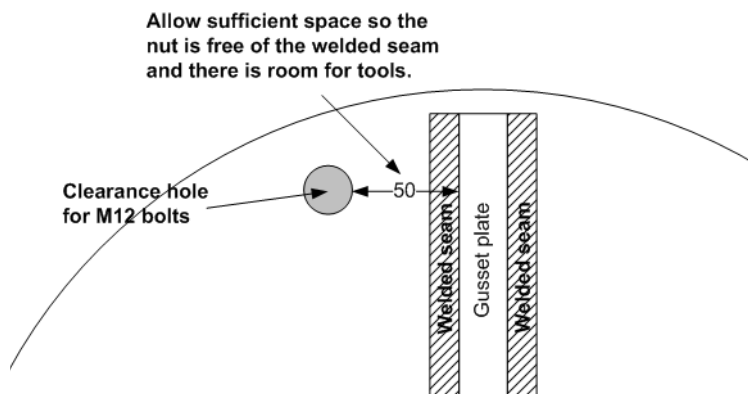


Figure 3-8: ADU mast flange, distance to the welded seam



CAUTION! Avoid sharp edges where the flange is in direct contact with the radome. Round all edges as much as possible to avoid damaging the surface of the radome.

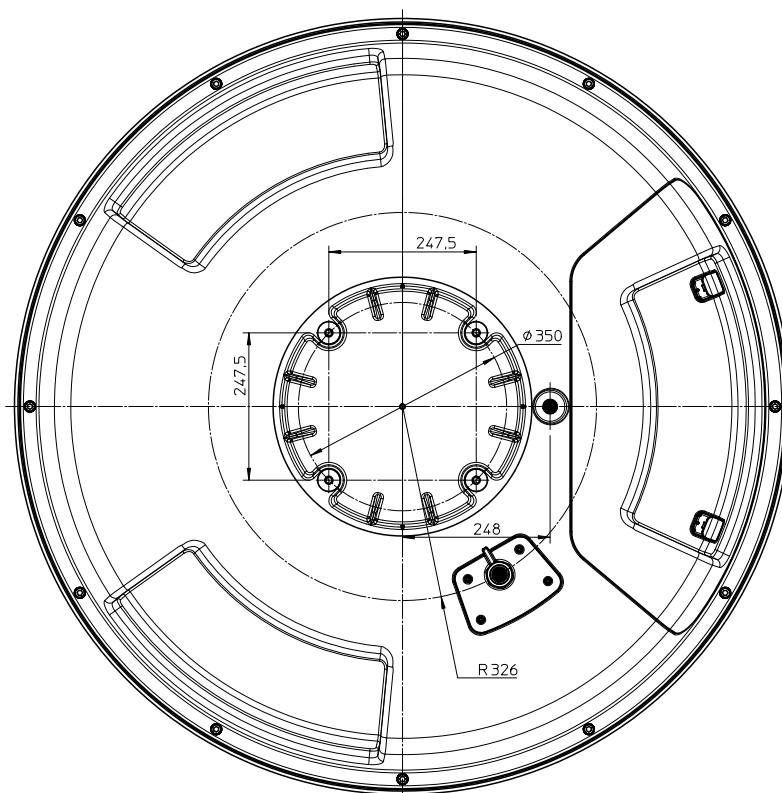


Figure 3-9: ADU, bottom view

3.2.6.2 Mast length and diameter

The placement of the ADU must ensure a rigid structural connection to the hull or structure of the ship. Parts of the ship with heavy resonant vibrations are not suitable places for the ADU. A small platform or short mast shall provide rigid support for the ADU fastening bolts and a rigid interface to the ship.

If it is necessary to use a tall mast, you must stabilise the mast with bracing. Note that the design values given below depend on rigid ADU-ship interfaces. The cross-sectional properties and the corresponding maximum free length give a natural frequency close to 30 Hz. It is recommended to shorten the mast length as much as possible to obtain higher frequencies. Preferably, mount stays or wires to stabilize the mast further.

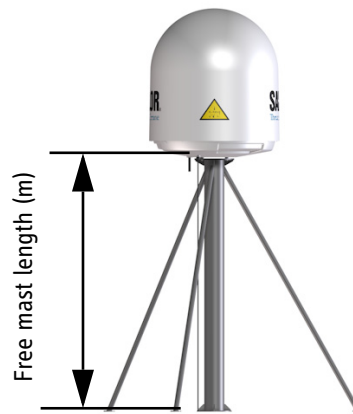


Figure 3-10: Free mast length and bracing for a tall mast

Note Make sure that there is free space below the drain tube. Read also *Condensation and water intrusion* on page 3-17.

The tables in the next sections give some suggested design values for the free mast length.

Note The tables list the values for **steel masts**. For **aluminium masts**, the free mast length is reduced to 75% of the values for steel.

Note Bracing and rigid masts can still not prevent vertical vibration if the mast is attached to a deck plate that is not rigid. Make every effort to mount the mast on a surface that is well supported by ribs. If this is not possible, provide extra deck plate propping.

3.2.6.3 SAILOR 900 VSAT ADU mast length

The below tables show the minimum dimensions for a SAILOR 900 VSAT ADU mast with and without stays or wires. Note that the values are only guidelines - always consider the environment and characteristics of the ship before deciding on the mast dimensions.


Mast without braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Weight (kg/m)
	0.4 ^a	200	5	24.0
	0.6	220	5	26.5
	0.8	250	5	30.2
	1	270	5	32.7

Table 3-2: Mast dimensions without braces

- a. The height of 0.4 m is not recommended to be used as it will make access through the ADU's service hatch difficult.

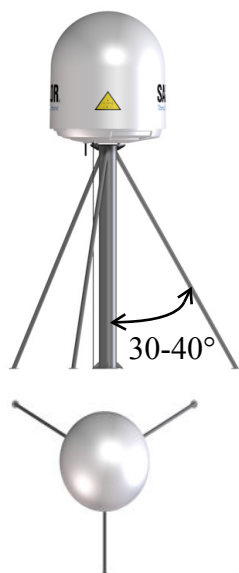
Mast with 3 braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter for brace (mm)	Thickness for brace (mm)
	1.2	140	10	50	5.0
	1.2	200	5	50	5.0
	1.6	140	10	70	5.0
	1.6	200	5	70	5.0
	2	160	10	70	5.0
	2	220	5	70	5.0
	2.5	180	10	80	5.0
	2.5	220	5	80	5.0

Table 3-3: Mast dimensions with 3 braces

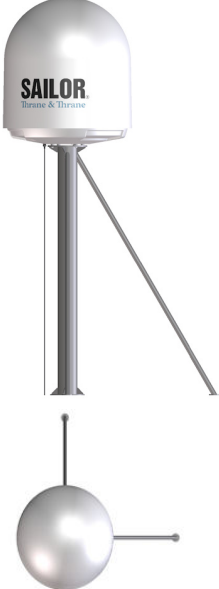
Mast with 2 braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter for brace (mm)	Thickness for brace (mm)
	1.2	160	10	80	5.0
	1.2	200	5	80	5.0
	1.6	180	10	80	5.0
	1.6	220	5	80	5.0
	2	180	10	80	5.0
	2	240	5	80	5.0
	2.5	200	10	80	5.0
	2.5	260	5	80	5.0

Table 3-4: Mast dimensions with 2 braces

3.2.7 Interference

Note

Do not place the ADU close to interfering signal sources or receivers. For allowed distances to other transmitters see Figure 3-12: *Recommended distance to transmitters (m) for frequencies below 1000 MHz* on page 3-16. We recommend testing the total system by operating all equipment simultaneously and verifying that there is no interference.

The ADU must be mounted as far away as possible from the ship's radar and high power radio transmitters, because they may compromise the ADU performance. RF emission from radars might actually damage the ADU.

The SAILOR 900 VSAT ADU itself may also interfere with other radio systems.

3.2.7.1 Radar

It is difficult to give exact guidelines for the minimum distance between a radar and the ADU because radar power, radiation pattern, frequency and pulse length/shape vary from radar to radar. Further, the ADU is typically placed in the near field of the radar ADU and reflections from masts, decks and other items in the vicinity of the radar are different from ship to ship.

However, it is possible to give a few guidelines. Since a radar radiates a fan beam with a horizontal beam width of a few degrees and a vertical beam width of up to $\pm 15^\circ$, the worst interference can be avoided by mounting the ADU at a different level – meaning that the ADU is installed minimum 15° above or below the radar antenna. Due to near field effects the benefit of this vertical separation could be reduced at short distances (below approximately 10 m) between radar antenna and the SAILOR 900 VSAT ADU. Therefore it is recommended to ensure as much vertical separation as possible when the SAILOR 900 VSAT ADU has to be placed close to a radar antenna.

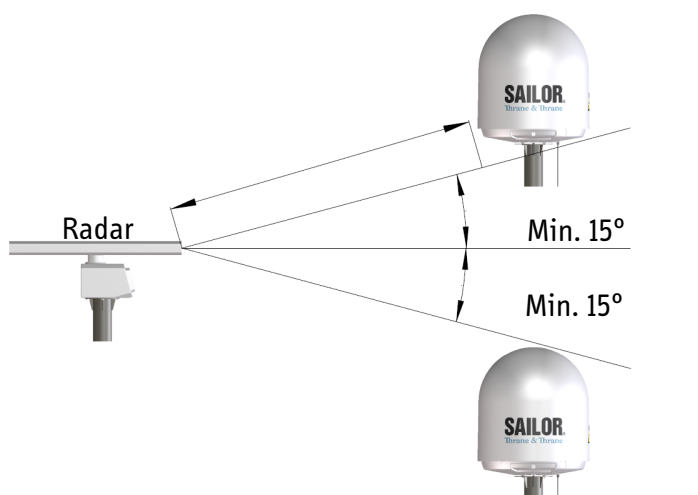


Figure 3-11: Interference with the vessel's radar

3.2.7.2 Radar distance

The minimum acceptable separation ($d_{min.}$) between a radar and the ADU is determined by the radar wavelength/frequency and the power emitted by the radar. The tables below show some “rule of thumb” minimum separation distances as a function of radar power at X and S band. If the $d_{min.}$ separation listed below is applied, antenna damage is normally avoided.

“ $d_{min.}$ ” is defined as the shortest distance between the radar antenna (in any position) and the surface of the SAILOR 900 VSAT ADU.

X-band (~ 3 cm / 10 GHz) damage distance		
Radar power	SAILOR 900 VSAT ADU	
	d min. at 15° vertical separation	d min. at 60° vertical separation
0 – 10 kW	1.0 m	1.0 m
30 kW	2.0 m	1.0 m
50 kW	3.3 m	1.7 m

Table 3-5: Minimum radar separation, X-band

S-band (~ 10 cm / 3 GHz) damage distance		
Radar power	SAILOR 900 VSAT ADU	
	d min. at 15° vertical separation	d min. at 60° vertical separation
0 – 10 kW	2.0 m	1.0 m
30 kW	3.0 m	1.5 m
50 kW	5.0 m	2.5 m

Table 3-6: Minimum radar separation, S-band

The separation distance for C-band (4-8 GHz) radars should generally be the same as for X-band radars.

3.2.7.3 Radar interference

Even at distances greater than “d min.” in the previous section the radar might still be able to degrade the performance of the SAILOR 900 VSAT system.

The presence of one or more S or X-band radars within a radius up to 100 m may cause a minor degradation of the Ku-band connection. The degradation will be most significant at high radar pulse repetition rates.

As long as receiving conditions are favourable, this limited degradation is without importance. However, if receiving conditions are poor – e.g. due to objects blocking the signal path, heavy rainfall or icing, low satellite elevation and violent ship movements – the small extra degradation due to the radar(s) could cause poor connection quality.

The presence of S-band radar(s) is unlikely to cause any performance degradation – as long as the minimum distances (d min.) listed in the previous section are applied.

It is strongly recommended that interference free operation is verified experimentally before the installation is finalized.



CAUTION! The ADU must never be installed closer to a radar than “d min.” – even if experiments show that interference free operation can be obtained at shorter distances than “d min.” in the previous section.

3.2.7.4 GPS receivers

Good quality GPS receivers will work properly very close to the ADU - typically down to one meter outside the main beam.

3.2.7.5 Other transmitters

See the following figure for minimum recommended distance to transmitters in the frequency range below 1000 MHz.

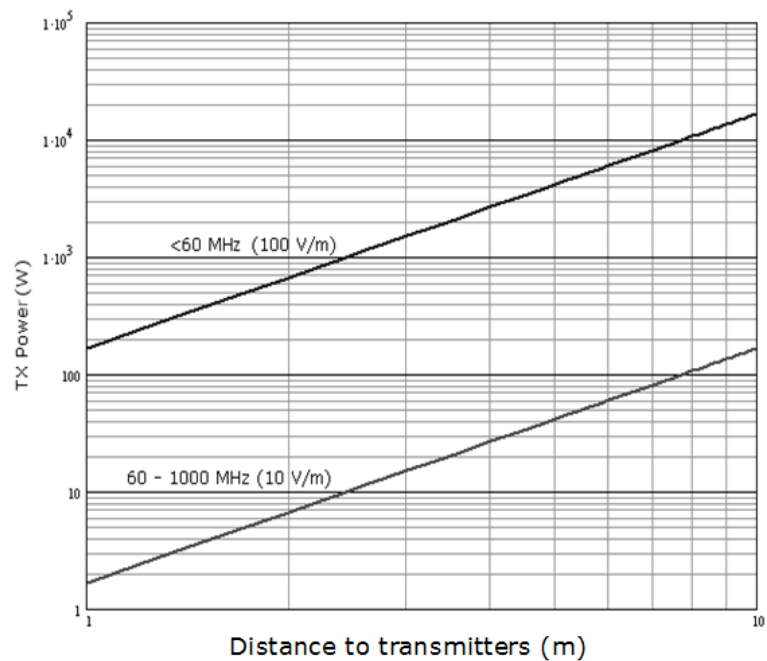


Figure 3-12: Recommended distance to transmitters (m) for frequencies below 1000 MHz

3.2.8 Other precautions

3.2.8.1 Condensation and water intrusion

If possible, install the radome such that direct spray of seawater is avoided. In some weather conditions there may occur condensation inside the radome. The drain tube is designed to lead any water away from inside the radome. Make sure the ADU's drain tube is open and that there is free space between the drain tube and the mounting surface so water can escape and there is ventilation for the ADU.



Figure 3-13: Drain pipe with free space

It is recommended not to use pneumatic tools for cleaning the radome, especially at a short distance and directly at the split between top and bottom.

3.2.8.2 Deposits

Do not place the ADU close to a funnel, as smoke deposits are corrosive. Furthermore, deposits on the radome can degrade performance.

3.3 Installation of the ADU

The ADU is shipped fully assembled. You have to install it on the mast and attach the ADU cable.



WARNING! Use a strong webbed sling with a belt to lift the ADU without damaging the radome. Make sure that the sling can carry the ADU's weight (135 kg, 288 lbs).



WARNING! The ADU may be subject to swaying motions in windy conditions. Always use tag lines to stabilise the ADU during hoisting.

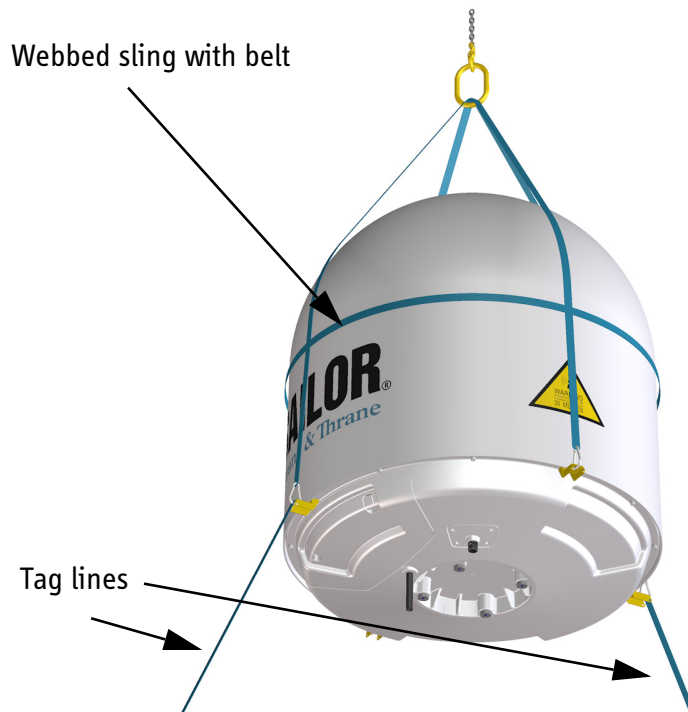


Figure 3-14: Use of strong sling with a belt and tag lines for safe hoisting
Before installing the ADU read the following guidelines.

3.3.1 Installing the ADU

Make sure that there is sufficient space underneath the ADU to open the service hatch. Through this hatch you access the ADU modules for service and maintenance.



Figure 3-15: Free space for access to the service hatch

The ADU does not have to be aligned with the bow-to-stern line of the ship. When configuring the SAILOR 900 VSAT you make an azimuth calibration to obtain the correct azimuth of the ADU.

- It is important to maintain **vertical orientation of the ADU center line**.
- Consider the aspect of interference, read more about this in *ADU mast design: Foundation and height* on page 3-8.
- Install the ADU where **vibrations are limited to a minimum**.
- Always use **all 4 bolts** when installing the ADU.

To install the ADU, do as follows:

1. Install the mast with the mast flange and have the 4 M12 bolts ready.
2. Undo all shipping buckles, take off the wooden top and remove the casing.
3. Unscrew the 4 bolts holding the ADU on the wooden platform.

4. Attach a webbed, four-part sling with a belt to all 4 lifting brackets.



Figure 3-16: ADU installation, webbed sling attached to the 4 lifting brackets

5. Attach 2 tag lines of suitable length to 2 lifting brackets and man them.
6. With a crane lift the ADU off the wooden platform and move it on top of the ADU mast.
7. Install the ADU on the mast flange with 4 M12 bolts and washers. Read carefully and follow instructions given in *Grounding the ADU* on page F-3.
Tightening torque value: 30 Nm



Figure 3-17: Mounting the ADU on the mast flange

8. Put the coaxial ADU cable through the protection plate as shown in the following figure, and connect the N connector of the ADU cable to the ADU.

Select a suitable size for the cable gland: 16–20 mm diameter or 19–23 mm diameter. See also *N-connector interface on the ADU* on page A-9 for a more detailed drawing how to connect the N-connector on the ADU.

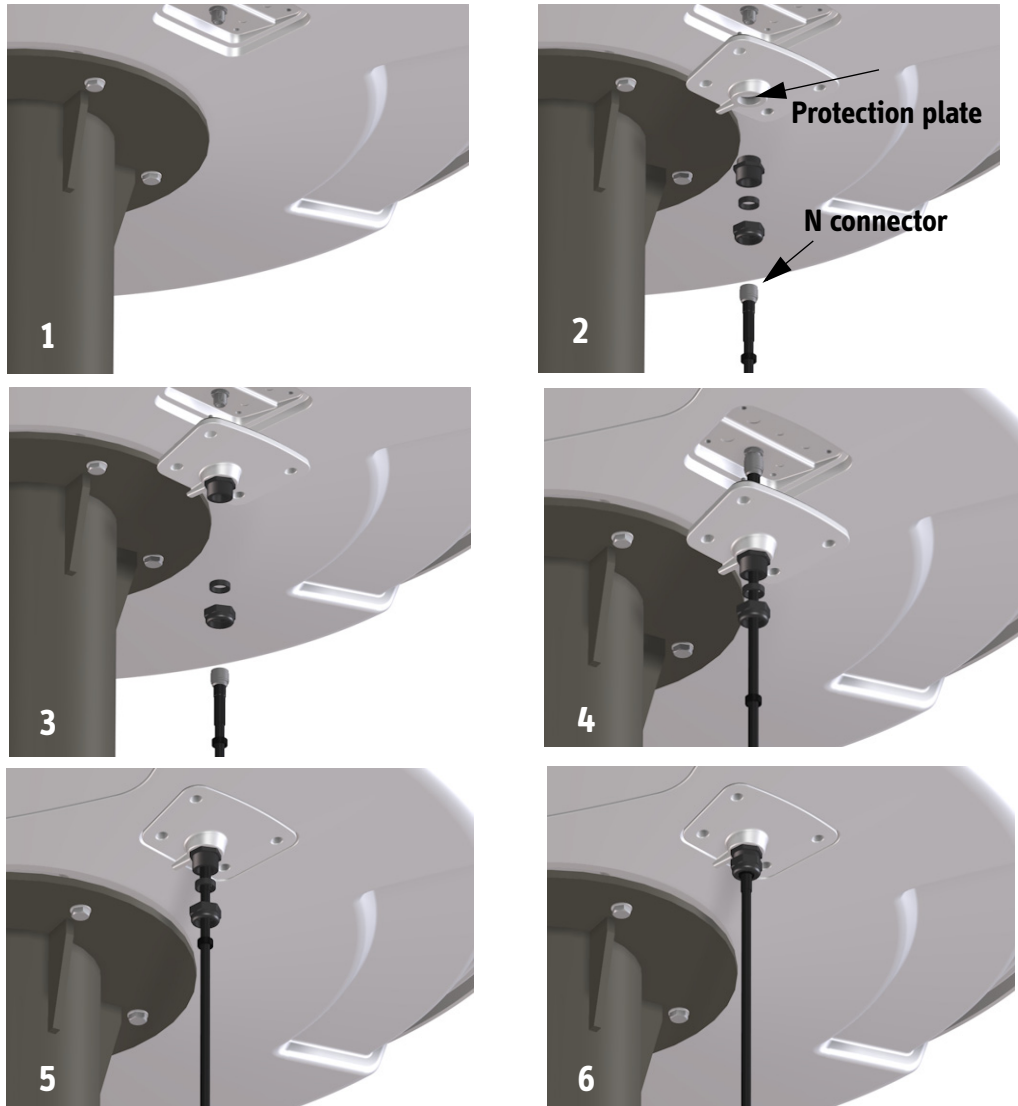


Figure 3-18: Connecting the ADU cable

Ensure that the connector assembly is properly protected against seawater and corrosion. As a minimum, wrap it with self-amalgamating rubber.

9. Put the protection plate in place and fasten the 4 bolts (picture 5).
10. Fasten the nut (picture 6).

Where the cables are exposed to mechanical wear – on deck, through bulkheads, etc. – protect the cables with steel pipes.

Otherwise, follow standard procedures for cabling in ship installations.

3.3.1.1 Maximum allowed RF loss in the ADU cable

Maximum allowed cable loss ≤ 20 dB at 1950 MHz. This is to ensure optimum performance of the system.

3.3.2 Opening and removing the service hatch

Open the hatch to access the antenna modules. The two latches of the service hatch must be locked by fastening the two screws in the latches with a Torx TX20 screw driver to protect the ADU modules against unauthorised access.

You can remove the hatch for better mobility when servicing the antenna. Do as follows to open and remove the service hatch:

1. With a Torx TX20 screw driver, remove the two screws locking the latches.
2. Pull open the two latches and let the lid fall open.



Figure 3-19: Opening the service hatch

3. Remove the 2 split pins and park them.



Figure 3-20: Removing the 2 split pins

4. Pull the service hatch free. A wire keeps the service hatch attached to the antenna.

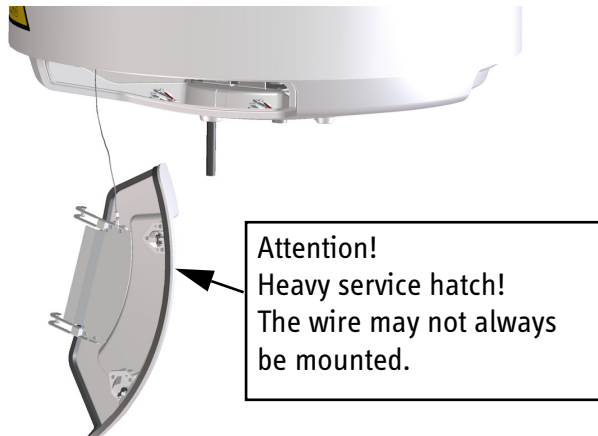


Figure 3-21: Removing the service hatch

3.3.3 Grounding the ADU

The ADU must be grounded using the mounting bolts. If the ADU cannot or should not be electrically connected directly to the mounting surface, you can use a separate grounding cable to make the connection between the ADU and the common ground to which the ACU is also connected. If grounding to the ship ground is impossible, for example if you have a fibre glass hull, see *Alternative grounding for fibre glass hulls* on page F-9.

To obtain a good ground connection, the metal underneath the head of **at least** one bolt must be clean of insulating protective coating and a serrated washer should be used. After tightening the bolts we recommend that you seal the area suitably in order to avoid corrosion of the grounding point. Use stainless steel bolts and washers.

Optimum grounding is achieved by connecting the ground wire to the bolt marked in Figure 3-22.

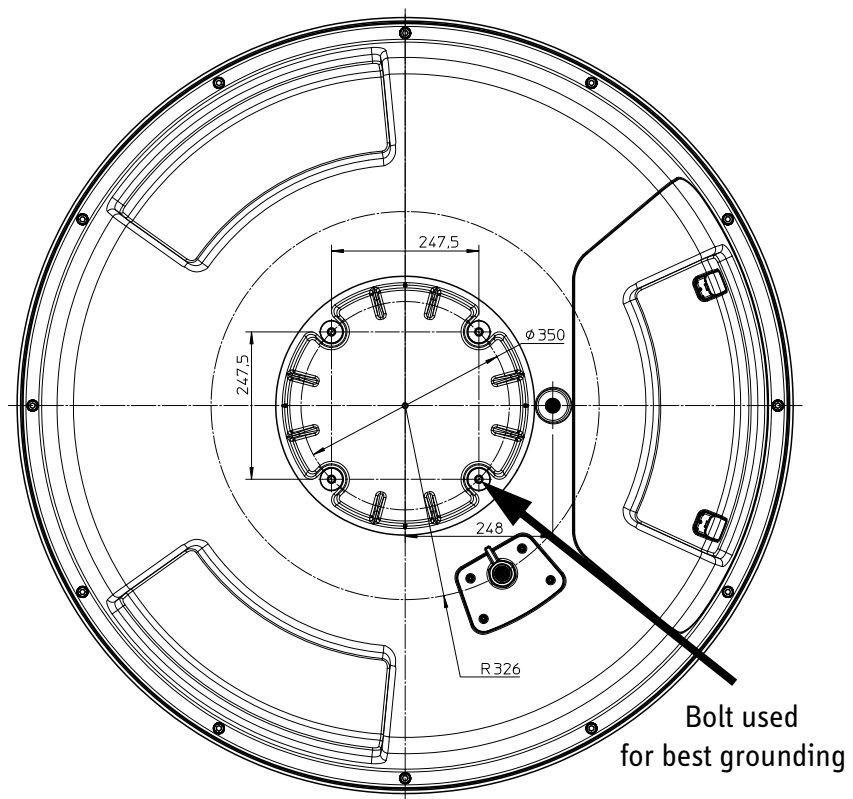


Figure 3-22: ADU, bolt for optimum grounding

For further information on grounding and RF protection see *Grounding and RF protection* on page F-1.

3.3.4 Alternative ADU cable

The maximum allowed RF-loss in the ADU cable must be ≤ 20 dB at 1950 MHz and 0.9 Ohm DC. This is to ensure the performance of the system. Preferably choose one of the cable types listed in the table below.

Cable Type	Absolute maximum length
G02232-D	6 m
RG223-D	25 m
RG214/U	50 m
S 07272B-05	95 m

Table 3-7: ADU cable types and maximum lengths

Check the data sheet from the cable supplier that both the RF-attenuation and the DC-resistance are kept within the maximum specified values:

- ADU cable RF-attenuation at 1950 MHz: max. 20 dB including connector.
- ADU cable modem-attenuation at 10 MHz: Max. 2 dB
ADU cable modem-attenuation at 36 and 54 MHz: Max. 4 dB
- ADU cable loop DC-resistance max: 0.9 Ohm.

Also ensure that the specified minimum bending radius is respected. If this is not the case, the loss in the cable will increase. Check the documentation from the cable supplier.

3.4 Installation of the ACU (bulkhead)

The following sections describe the installation of the bulkhead ACU.

Installation of the SAILOR 900 VSAT 19" Rack ACU is described in *Installing the 19" rack version of the ACU* on page 3-30.

3.4.1 Installing the ACU (bulkhead)

The cable relief for the ACU is already mounted when receiving the ACU. The cable relief is a simple system to secure cables with cable strips. It offers a number of holders to which you can secure the cables from the ACU.

1. Place the ACU on a desktop.
If required, fasten the ACU to the desktop with 6 screws: Insert the mounting bolts (M5) through the mounting holes and into the mounting surface.
2. Make sure the grounding requirements are met. See *Grounding the ACU (bulkhead)* on page 3-27 and the appendix *Grounding and RF protection* on page F-1 for details about grounding.
3. Connect all cables. See *Interfaces of the SAILOR 900 VSAT ACU* on page 4-1 for a description of the ACU connectors.
4. Secure the cables using cable strips.

3.4.1.1 Connectors of the ACU

The ACU has the following connectors:

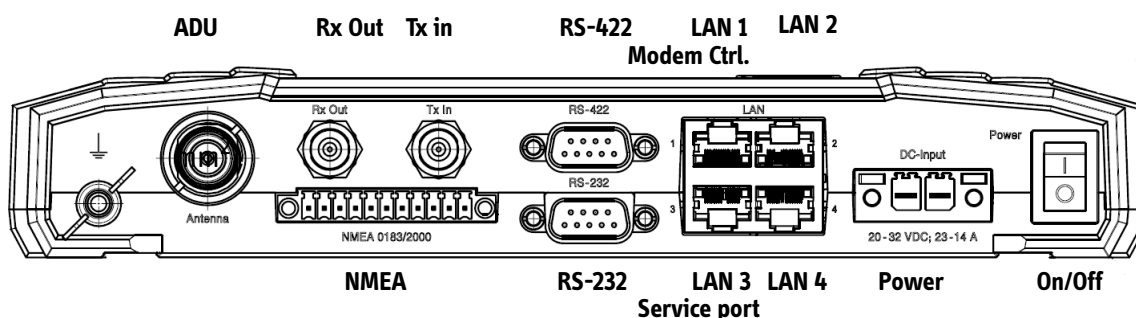


Figure 3-24: ACU, connector panel

Each connector is described in detail in *Interfaces of the SAILOR 900 VSAT ACU* on page 4-1.

For information on wiring 24 V DC power see *DC Input connector* on page 4-3.

For more information about power supply and power requirements see *Connecting power* on page 5-1.

3.4.2 Grounding the ACU (bulkhead)

Make sure that the grounding requirements are met. This is important to protect the ACU against lightning. See the appendix *Grounding and RF protection* on page F-1 for details about grounding.

3.4.2.1 ADU cable

The ADU is connected to the ACU with the ADU cable (coax cable) with an N connector at both ends. For information on ADU grounding, see *Grounding the ADU* on page 3-23.

At the ACU end, it is strongly recommended to ground the ADU cable. Use a short cable from the ACU to a grounding point and connect the short cable to the ADU cable at this grounding point, making sure the shield of the connector is properly connected.

3.4.2.2 Ground stud

To ensure that the ACU is grounded – also if the cable is disconnected from the ACU, connect an extra ground wire to the ground stud on the ACU. This ground wire must be a heavy wire or braid cable with a larger diameter than the coax cable (minimum cross section: 4 mm²).

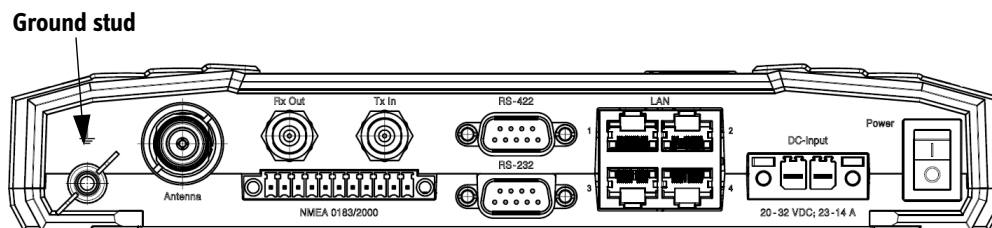


Figure 3-25: SAILOR 900 VSAT ACU, bulkhead version, ground stud

3.4.3 SAILOR 900 VSAT ACU (bulkhead) with cable support

You can mount a Cable Relief for the ACU (bulkhead). This is a simple system to which you can secure your cables using cable strips. When mounted on the ACU the cable relief offers a number of holders to which you can secure the cables from the ACU, using cable strips.

To mount the cable relief, do as follows:

1. Remove the two rubber washers from the bottom of the ACU at the connector panel end. The threaded bushings underneath the rubber washers are used for mounting the cable support.

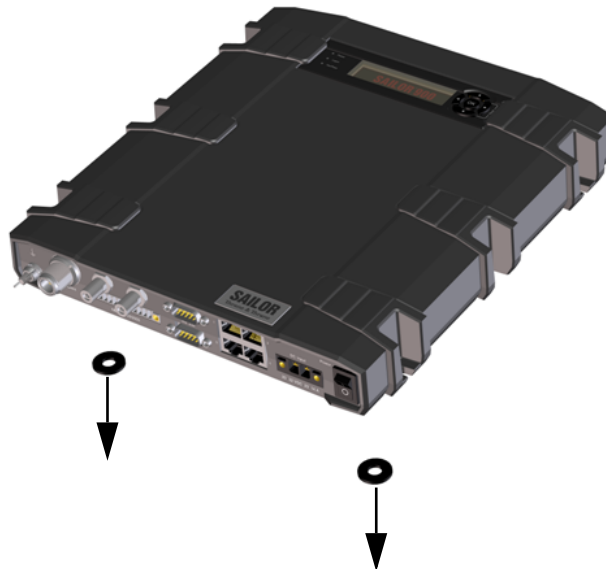


Figure 3-27: Mounting the cable relief 1/2

2. Fasten the Basic cable support to the ACU using two M4 x 6 mm countersunk screws.

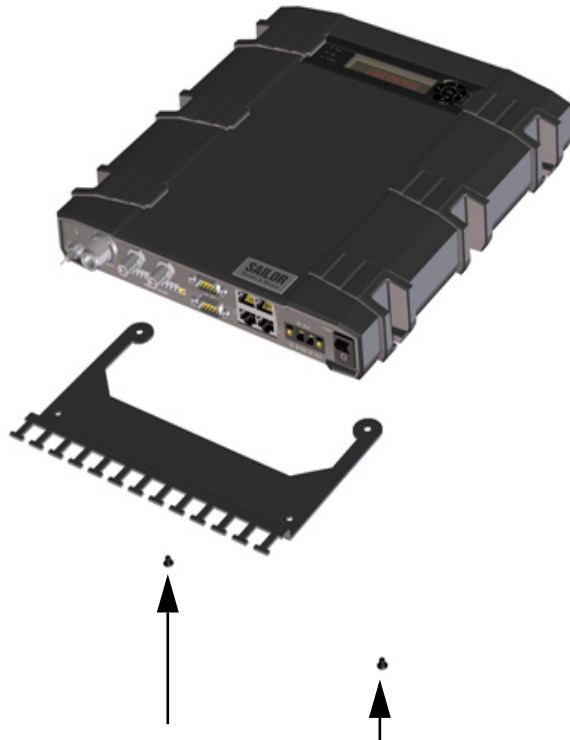


Figure 3-28: Mounting the cable relief 2/2

3. Mount the ACU by inserting 6 screws through the holes in the mounting bracket and into the mounting surface.
4. Make sure the grounding requirements are met. See *Grounding the ACU (bulkhead)* on page 3-27 and the appendix *Grounding and RF protection* on page F-1 for details about grounding.
5. Connect all cables. See *Interfaces of the SAILOR 900 VSAT ACU* on page 4-1 for a description of the ACU connectors.
6. Secure the cables to the cable relief using cable strips.

3.5 Installation of the 19" rack version of the ACU

The following sections describe the installation of the 19" rack ACU. Installation of the SAILOR 900 VSAT ACU is described in *Installation of the ACU (bulkhead)* on page 3-26.

3.5.1 Installing the 19" rack version of the ACU

A cable relief bracket is already mounted when receiving the ACU. The cable relief is a simple system to secure cables with cable strips. It offers a number of holders to which you can secure the cables from the ACU. To install the 19" rack version of the ACU, do as follows:

1. Slide the ACU into a 1U space in a 19" rack.
2. Mount the screws in each side through the holes in the front and fasten the screws to the rack. Make sure that the unit is mounted securely according to the requirements for your 19" rack.
3. Connect all cables. See *Interfaces of the SAILOR 900 VSAT ACU* on page 4-1 for a description of the ACU connectors.



Figure 3-29: ACU, 19" rack version, On/off switch at the back

4. Set the On/Off switch at the back of the ACU to On. Then you can use the On/Off switch at the front panel of the ACU 19" rack version.

3.5.1.1 Connectors of the 19" rack version of the ACU

For a description of the connectors see *Connectors of the ACU* on page 3-26. The 19" rack version of the ACU has additionally a LAN connector at the front for accessing the service port from the ACU front panel.



Figure 3-30: ACU, LAN connector at the front: Service port

For information on wiring 24 VDC power see *DC Input connector* on page 4-3. For more information about power supply and power requirements see *Connecting power* on page 5-1.

3.5.2 Grounding the 19" rack version of the ACU

Make sure that the grounding requirements are met. See the appendix *Grounding and RF protection* on page F-1 for details about grounding.

3.5.2.1 ADU cable

The ADU is connected to the ACU with the ADU cable (coax cable) with an N connector at both ends. For information on ADU grounding, see *Grounding the ADU* on page 3-23.

At the ACU end, it is strongly recommended to ground the ADU cable. Use a short cable from the ACU to a grounding point in the rack and connect the short cable to the ADU cable at this grounding point, making sure the shield of the connector is properly connected to the rack.

3.5.2.2 Ground stud at the ACU

To ensure that the ACU is grounded – also if the ADU cable is disconnected from the ACU, connect an extra ground wire from the rack to the ground stud on the ACU. This ground wire must be a heavy wire or braid cable with a larger diameter than the coax cable.



Figure 3-31: ACU, 19" rack version, ground stud

3.6 Installation of the VMU

For a list of supported VSAT modems see the SAILOR 900 VSAT data sheet or Figure 6-17: *Supported VSAT modems in software version 1.30*.

3.6.1 General mounting considerations – VMU

1. Mount the VMU close to the ACU, preferably at a distance less than 1 m.
2. Connect all cables. See *Interfaces of the VMU* on page 4-9 for a description of the connectors for supported VSAT modems.
For cable specifications see *VMU cable specifications* on page B-1.

3.6.1.1 Connectors and pin-out of the VMU

For connectors and pin-out see the user documentation of the VMU and *Interfaces of the VMU* on page 4-9.

3.6.1.2 Wiring Power

Provide power to the VMU as described in the user documentation of the unit.

3.7 Installing the dual-antenna mode¹ (optional)

You can use the SAILOR 900 VSAT in dual antenna mode with 2 ADUs, 2 ACUs and the dual-antenna accessories kit. The kit consists of 2 75 Ohm RF cables, an RF splitter and an RF combiner. In case one antenna enters a blocking zone, the other antenna of the dual-antenna system takes over and the system continues working.

There is a Master ACU and a Slave ACU. The VSAT modem is connected to and configured in the Master ACU. The Slave ACU is configured as a slave unit. It is connected with an Ethernet cable to the Master ACU from which it gets all satellite information.

The switching from one antenna to the other is done based on the programmed blocking zones in the two antennas and takes effect whenever signal blockages occur from cranes etc.

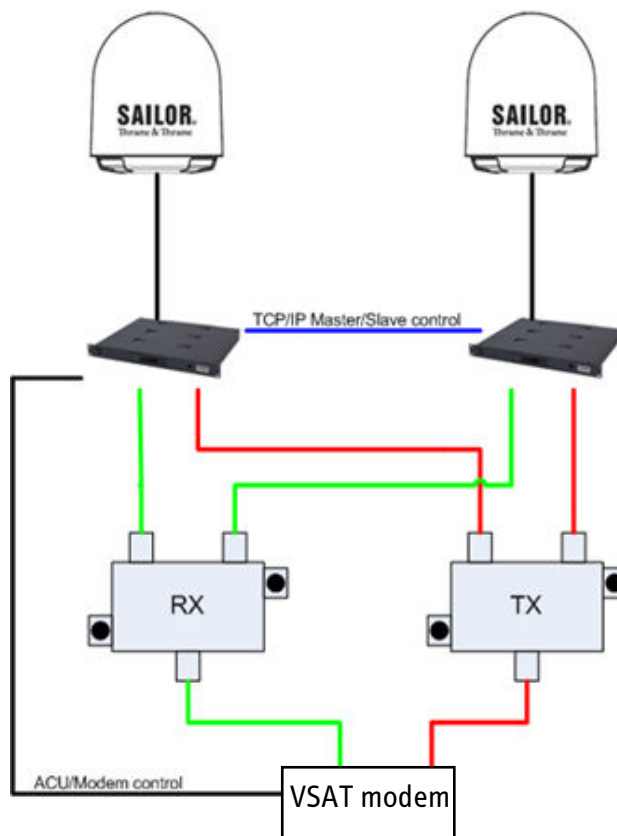


Figure 3-32: Dual mode antenna, overview

1. Patent pending.

To install the dual antennas, do as follows:

1. Install the master ADU, ACU, the RX combiner and the VSAT modem as shown in figure 3-32.
2. Install the slave ADU, ACU, the TX splitter as shown below.
3. Connect the cables as shown below and in the table below.

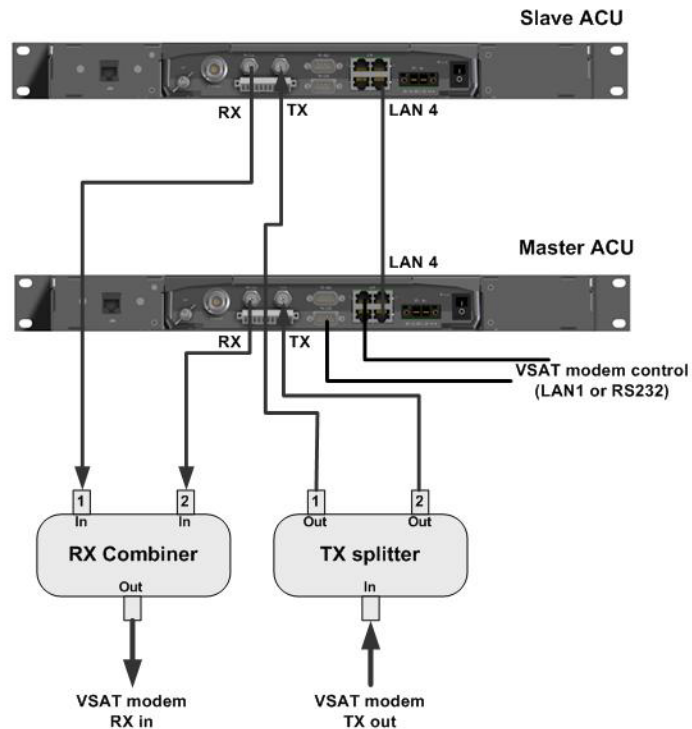


Figure 3-33: Dual mode antenna, connecting cables (example)

Connect cables	Purpose
Master ACU LAN port 4 to Slave ACU LAN port 4	Master/Slave control
Master ACU LAN port 1 or RS 232 to VSAT modem control	VSAT modem control
Master ACU Rx Out to the Rx combiner input 1	Rx when Master active
Slave ACU Rx Out to the Rx combiner input 2	Rx when Slave active
Rx combiner output to VSAT modem Rx	Rx to VSAT modem
Master ACU Tx In to the Tx splitter output 1	Enabled when Master active
Slave ACU Tx In to the Tx splitter output 2	Enabled when Slave active
Tx splitter input to VSAT modem Tx	Tx from VSAT modem

Table 3-8: Dual mode antenna, cabling

Interfaces

This chapter is organised in the following sections:

- *Interfaces of the SAILOR 900 VSAT ACU*
- *Interfaces of the VMU*

4.1 Interfaces of the SAILOR 900 VSAT ACU

4.1.1 ACU bulkhead – LEDs, display and keypad



Figure 4-1: ACU bulkhead, LEDs, display and keypad

4.1.2 ACU 19" rack version – LEDs, display and keypad



Figure 4-2: ACU rack version, LEDs, display and keypad

4.1.3 ACU bulkhead – Connector panel – overview

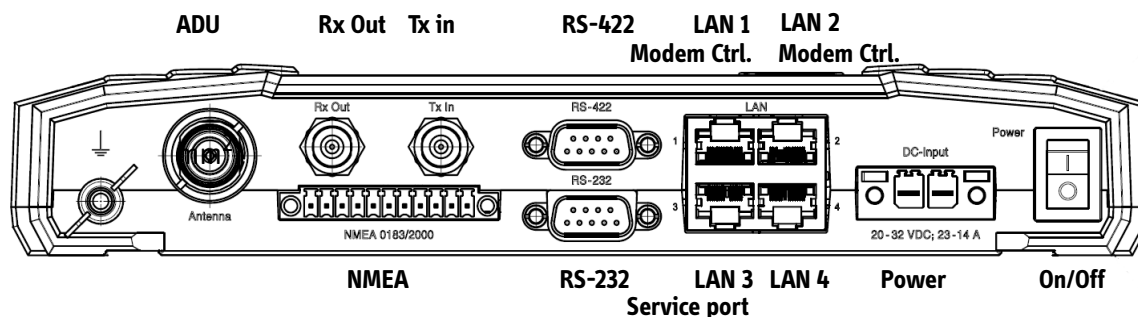


Figure 4-3: ACU bulkhead, connector panel overview

4.1.4 ACU 19" rack version – Connector panel – overview

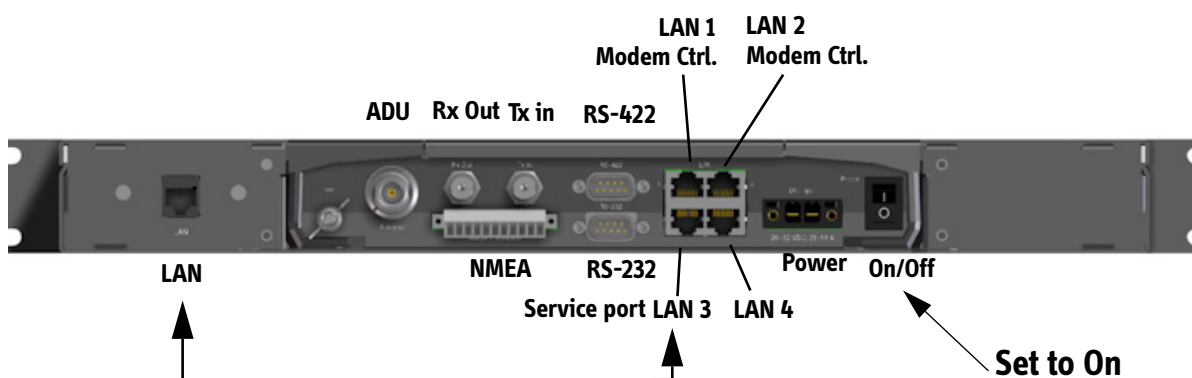


Figure 4-4: ACU rack version, connector panel overview

The connector LAN to the left is typically connected to the service port at LAN3 with a straight Ethernet cable. Then you can access the service port from the front of the ACU rack version.

Important

Set the On/Off switch at the back of the ACU to On. Then you can use the On/Off switch at the front panel of the ACU 19" rack version.

Connect the Ethernet cable to provide connection to the service port on the front of the ACU 19" rack version.

4.1.5 DC Input connector

Provide DC power to the ACU, for example by using the TT-6080A Power Supply or 24 VDC from the vessel's power supply.

DC input: Female plug (Weidmuller, Part number 1930050000) for wires up to AWG10/6 mm².

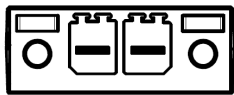
Outline (on the ACU)	Pin	Pin function	Wire color
 Vin+ Vin-	Left	Vin+	Red
	Right	Vin-	Black

Table 4-1: DC Input plug, outline and pin assignment

The connector for DC input is included in the delivery. Insert the power cable as shown below, and plug in the connector. Use the two red clamps to fasten the connector.

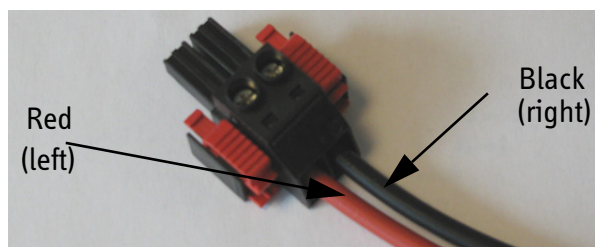


Figure 4-5: DC Input connector with power cable

For more information about power supply and power requirements see *Connecting power* on page 5-1.

4.1.6 ADU connector

There is just one cable from the ACU to the ADU. This is used to power the ADU, supply 10 MHz clock, handle all communication between ACU and ADU, and deliver the VSAT Rx and Tx signals.

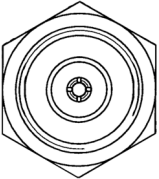
Outline (on the ACU)	Conductor	Pin function
	Inner	DC to ADU 10 MHz clock to ADU ACU to ADU internal communication VSAT Rx/Tx
	Outer	GND (Shield)

Table 4-2: N connector, outline and pin assignment

Important

Do not use TNC connectors on the ADU antenna cable or on pigtails. TNC connectors cannot carry the DC current for operating the ADU.

4.1.7 Rx/Tx connectors for VMU

Connect the Rx and Tx channels of the VMU to the Rx and Tx connectors of the ACU with the 2 supplied Rx/Tx cables (75 Ohm coax, F-F, 1 m).


Outline (on the ACU)	Pin number	Pin function
	1	Inner conductor: 10 MHz clock, VSAT Rx/Tx
	2	Outer conductor: GND (Shield)

Table 4-3: F connector, Rx and Tx, outline and pin assignment

For step-by-step guidelines how to set up the VSAT modem see *VMU settings requirements* on page C-1.

4.1.8 NMEA 0183 connector (RS-422)

Connect the ship's gyro to this connector.


Outline (on the ACU)	Pin number	Pin function	Wire color
	1	Not connected	–
	2	NET-H (NMEA 2000)	White
	3	NET-L (NMEA 2000)	Blue
	4	NET-S (NMEA 2000)	Red
	5	NET-C (NMEA 2000)	Black
	6	Not connected	–
	7	Not connected	–
	8	Shields. Ship ground. Connect only at one end.	
	9	Line B (+) NMEA 0183	
	10	Line A (-) NMEA 0183	
	11	Not connected	–

Table 4-4: NMEA 0183/2000 connector, outline and pin assignment

(Hardware prepared for NMEA 2000, for future use)

NMEA 2000 power: 9-16 VDC. NMEA 2000 LEN (Load Equivalency Number): 2 (100mA)

4.1.8.1 NMEA 0183

The NMEA 0183 connection supports IEC 61162-1 and IEC 61162-2.

- IEC 61162-1, baud rate 4800, format 8N1.
- IEC 61162-2, baud rate 38400, format 8N1.

The baud rate is auto detected by the ACU, the user cannot configure this interface.

Supported NMEA string:

1. HEHDT (North seeking Gyro compass)
2. GPHDT (GPS compass)
3. HNHDT (Non-North seeking gyro compass)

4. IIHDT (Integrated Instrument)

5. HCHDT (Magnetic compass)

Recommended NMEA 0183 cable:

Two-wire constructed with one enclosed shield

Network signal pair:

- Size: No. 24 AWG (0.24 sq. mm) or heavier
- Characteristic impedance: 95 - 140 Ohm
- Propagation delay: 5 nanoseconds per meter, maximum
- 15 Twists (minimum) per meter

4.1.9 RS-232 and RS-422 connectors

These connectors are used to access and configure the connected VSAT modem and for ACU control. See the VSAT modem requirements for use of the RS-232 or RS-422 connector.

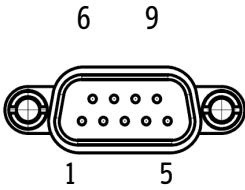
Outline (on the ACU)	Pin number	Pin function
	1	Not connected
	2	RXD
	3	TXD
	4	DTR
	5	Ground
	6	DSR
	7	RTS
	8	CTS
	9	Receive Signal Strength Indicator

Table 4-5: RS-232 connector, male, outline and pin assignment

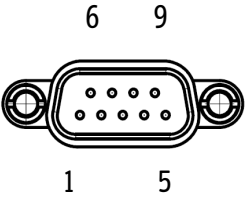
Outline (on the ACU)	Pin number	Pin function
	1	Ground
	2	Line A RXD (+)
	3	Line B TXD (-)
	4	Ground
	5	Ground
	6	Not connected
	7	Line A RXD (-)
	8	Line B TXD (+)
	9	Not connected

Table 4-6: RS-422 connector, male, outline and pin assignment

4.1.10 LAN1, LAN2, LAN3 and LAN4 connectors

Four Ethernet connectors (type RJ45) for PC/laptops, routers, wireless access points. The maximum cable length per connection is 100 m. Depending on the VMU connected, a LAN connector may be used for modem control.

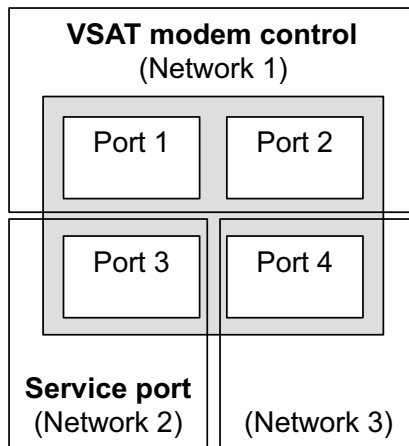


Figure 4-6: LAN1 –LAN4 connectors

For information how to configure the LAN network see *Configuring the LAN network* on page 6-29.

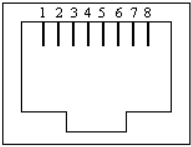
Outline	Pin number	Pin function	Wire color
	1	Tx+	White/orange
	2	Tx-	Orange
	3	Rx+	White/green
	4	Not connected	Blue
	5	Not connected	White/blue
	6	Rx-	Green
	7	Not connected	White/brown
	8	Not connected	Brown

Table 4-7: Ethernet connector, outline and pin assignment

Cable type: CAT5, shielded.

4.2 Interfaces of the VMU

For interfaces of the VMU and how to connect a VMU correctly to the ACU see the following sections and the user documentation of the VMU.

For step-by-step guidelines how to set up the VSAT modem see Appendix C, *VMU settings requirements*.

4.2.1 Connecting an iNFINITI® Series Satellite Router

Connect the VSAT modem to the ACU as shown in the figure below:

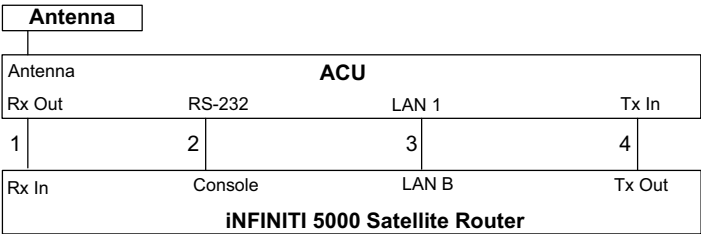


Figure 4-7: Connecting an iNFINITI® Series Satellite Router

Note Cable 3 is only used when using OpenAMIP protocol.

Cable	Description	Cable specifications
1	RX Out to Rx In	75 Ohm coax cables F-F (1m), included
2	RS-232 to Console	<p>VSAT modem</p> <p>5 — GND — 5</p> <p>8 — Signal power — 9</p> <p>RS-232 on ACU</p>
3	LAN 1 or 2	Standard Ethernet cable
4	Tx In to Tx out	75 Ohm coax cables F-F (1 m), included

Table 4-8: Cables to connect an iNFINITI® Series Satellite Router

For a detailed cable specification for VSAT modems see *VMU cable specifications* on page B-1. For step-by-step guidelines how to set up the VSAT modem see Appendix C, *VMU settings requirements*.

4.2.2 Connecting an Evolution® Satellite Router

Connect the VSAT modem to the ACU as shown in the figure below:

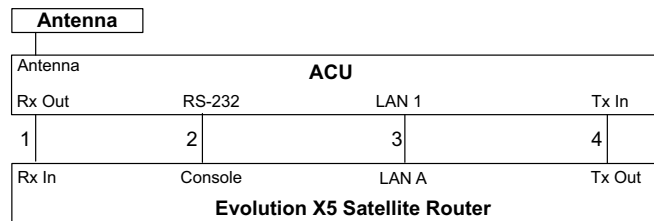


Figure 4-8: Connecting an Evolution Satellite Router

Note Cable 3 is only used when using OpenAMIP protocol.

For cables see Table 4-8: *Cables to connect an iNFINITI® Series Satellite Router* on page 4-9. For VMU cable specifications see *VMU cable specifications* on page B-1.

4.2.3 Connecting a Comtech 570 L or 625 Satellite Modem

Connect the VSAT modem to the ACU as shown in the figure below:

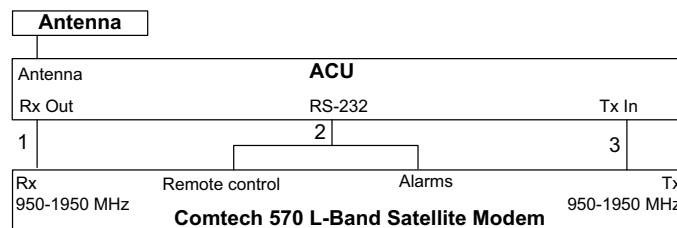


Figure 4-9: Connecting a Comtech 570 L or 625 Satellite Modem

Note If the satellite profile is configured to use **narrow band tracking** (recommended) a standard RS-232 cable can be used to connect the ACU RS-232 port to the Remote control port of the VSAT modem.

If the satellite profile is configured to use modem **RSSI tracking** a proprietary RS-232/Alarm cable must be used to connect the ACU RS-232 port to the Remote control and Alarm port of the VSAT modem.

Cable	Description	Cable specifications
1	RX Out to Rx 950-1950 MHz	75 Ohm coax cables F-F (1m) and adapter F to N 50 Ohm, included
2	RS-232 to Remote control and Alarms	37-134337-A Cable Comtech Serial and RSSI

Table 4-9: Cables to connect a Comtech 570 L-Band Satellite Modem

Cable	Description	Cable specifications
3	Tx In to Tx 950-1950 MHz	75 Ohm coax cables F-F (1 m), included

Table 4-9: Cables to connect a Comtech 570 L-Band Satellite Modem

For VMU cable specifications see *VMU cable specifications* on page B-1.

4.2.4 Connecting a Satlink2900 VSAT modem

Connect the VSAT modem to the ACU as shown in the figure below:

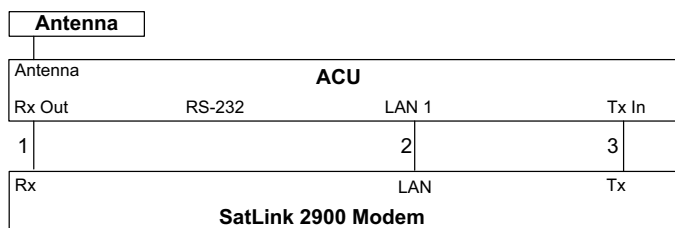


Figure 4-10: Connecting a SatLink 2900 Modem

Cable	Description	Cable specifications
1	RX Out to Rx	75 Ohm coax cables F-F (1m) and adapter F to N 50 Ohm, included
2	LAN1 to LAN	Standard Ethernet cable
3	Tx In to Tx	75 Ohm coax cables F-F (1 m), included

Table 4-10: Cables to connect a SatLink 2900 VSAT modem

4.2.5 Connecting a Gilat SkyEdge II VSAT modem

Connect the VSAT modem to the ACU as shown in the figure below:

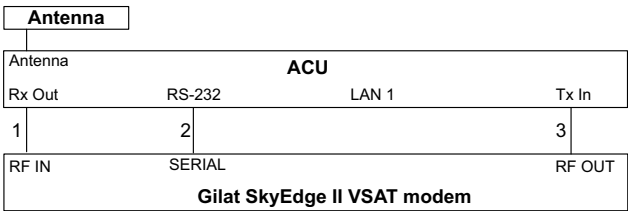


Figure 4-11: Connecting a Gilat SkyEdge II VSAT Modem

Cable	Description	Cable specifications
1	RX Out to RF IN	75 Ohm coax cables F-F (1m) and adapter F to N 50 Ohm, included
2	RS-232 to SERIAL	
3	Tx In to RF OUT	75 Ohm coax cables F-F (1 m), included

Table 4-11: Cables to connect a Gilat SkyEdge VSAT modem

Connecting power

This chapter is organised in the following sections:

- *Power source*
- *Power cable selection*
- *Connecting power*
- *Power up*

5.1 Power source

There are different options for the power supply:

- The 24 VDC ship supply provides power for the ACU.
- An AC line provides power through an AC/DC power supply. The TT-6080A Power Supply is recommended.

Note Be aware of high start-up peak current: 35 A at 24 VDC, 5 ms.

In order to protect against short circuit in the power cable/connector, the ship's DC outlet must be protected by a 30 A fuse or circuit breaker.

5.2 Power cable selection

5.2.1 Source impedance

The maximum length of the power cable depends on the type of cable used and the source impedance of the DC power installation in the ship.

The maximum allowed source impedance depends on the usage of the power range of the terminal DC input (Start up voltage: 22 VDC guaranteed, operating range: 20 – 32 VDC; 23 A - 14 A).

Select a power outlet from the DC system and measure the source impedance of the ship installation as described in the next section.

Note

If the total impedance is higher than the limits stated in section 5.2.3, the terminal may become unstable and start to on/off oscillate.

The total impedance is made up of the source impedance of the ship power supply plus the impedance of connected cables including connectors and joints where cables are extended.

For further recommendations on power cable selection, see *Power cable recommendations* on page 5-3.

5.2.2 Measuring the ship source impedance

Select a power outlet from the ship 24 VDC system and measure the source impedance of the ship installation as described below.

1. Measure the voltage without load (R.var disconnected).
2. Set the current to e.g. 1 A by adjusting R.var.
3. Measure the corresponding voltage change.

Example: 1 A and 50 mV. Source impedance: $50 \text{ mV} / 1 \text{ Amp} = 50 \text{ mOhm}$.

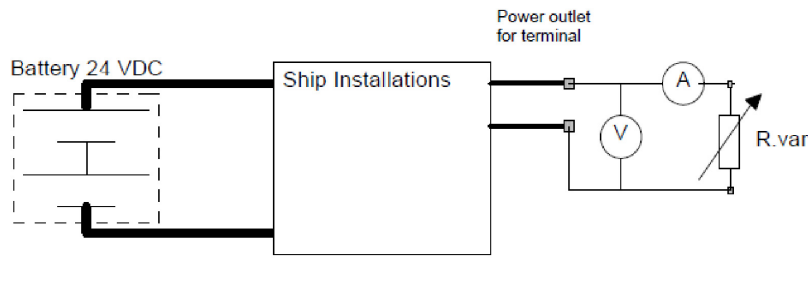


Figure 5-1: Measuring the ship source impedance

5.2.3 Power cable recommendations

5.2.3.1 Overview

The ACU is delivered with a power connector (PCB plug-in connector, female plug, Weidmuller, Part number 1930050000), which accepts wires up to AWG10/6 mm².

- When installing the power cable, install positive and negative supply wires closely together side by side to keep cable inductance low.
- Ensure that cable inductance for the selected cable at the desired length is less than 50 uH. Approximately 50 m maximum length.

5.2.3.2 Calculating the maximum power cable length

For 24 VDC operation, the total impedance must be max. 60 mOhm (R_{max}), including the source impedance in the ship installation (R_{source}).

The total impedance is made up of the following:

- Source impedance in the ship installation
- Impedance of the selected power cable

To calculate the maximum cable extension, do as follows:

1. First measure the source impedance in the ship installation as shown in *Measuring the ship source impedance* on page 5-2.
2. Find the resistance per meter (R_{wire}) for the cable type you are going to use.
For 4 mm²/AWG 11, the value is 4.8 mOhm/m at 55°C
For 6 mm²/AWG 10, the value is 3.8 mOhm/m at 55°C

For other cable types, refer to the data sheet for the cable.

$$\text{Maximum length} = 0,5 \times (R_{\text{max}} - R_{\text{source}}) / (R_{\text{wire}})$$

The length is multiplied by 0.5 above because there are two conductors in the cable.

If the TT-6080A Power Supply is used, use $R_{\text{source}} = 0 \text{ m}\Omega$.

5.2.3.3 Examples for using the TT-6080A Power Supply:

$$\text{AWG11}_{\text{max}} = 0.5 \times (60 \text{ m}\Omega - 0) / 4.8 \text{ m}\Omega/\text{m} = 6.2 \text{ m}$$

$$\text{AWG10}_{\text{max}} = 0.5 \times (60 \text{ m}\Omega - 0) / 3.8 \text{ m}\Omega/\text{m} = 7.9 \text{ m}$$

5.3 Connecting power

5.3.0.1 To connect the power cable to the ACU

1. Connect the positive and negative input terminals to the ship's DC supply according to the recommendations in the previous sections.
2. Connect the power plug to DC Input.

For information on pin-out, see *DC Input connector* on page 4-3.



Figure 5-2: Connecting power to DC Input

5.4 Power up

1. Connect power to the VMU.
2. Switch on the ACU. The unit starts up and goes through an initialization procedure:
 - ACU POST
 - ADU Initializing
 - ADU POST
 - READY

This may take some time (up to a couple of minutes).

3. The SAILOR 900 VSAT is ready to be calibrated (for first time power up) or receive data from the VSAT modem (when in normal operation). The ACU display shows the following message:



Figure 5-3: ACU display after first power on (example with LAN ports 1 and 4 used)

The LEDs **Power** and **Fail/Pass** are **steady green**, the LED Logon is off. For further information on status indicators see *Status signalling with LEDs and status messages* on page 9-8.

Make sure there are no hardware failures or error codes present, check the display of the ACU for events. For more information on error codes and events see *Troubleshooting* on page 9-91 and *System messages* on page G-1.

4. Continue to get the SAILOR 900 VSAT system operational, do the following:
 - Make a cable loss and an azimuth calibration.
 - Create VSAT modem profiles.
 - Create one or more satellite profiles.

For step-by-step instructions, see *Introduction to the built-in web interface* on page 6-1.

For installation check lists see, *Installation check* on page 7-1.

5.4.0.1 Initialisation in daily use

Once the system is configured and a satellite profile is active, the startup sequence is as follows:

- ACU POST
- ADU Initializing
- ADU SW upload (If the software versions in the ADU and ACU are not the same, a software update is done during startup.)
- ADU POST
- READY
- POINTING ANTENNA
- ACQUIRING SIGNAL
- TRACKING

5.4.0.2 SAILOR 900 VSAT operational

When the display shows **TRACKING** and the LED **Logon** is steady green, the system is operational.

Configuration

This chapter is organised in the following sections:

- *Introduction to the built-in web interface*
- *Calibration of the SAILOR 900 VSAT*
- *Configuration with the web interface*
- *Keypad and menus of the ACU*
- *SNMP support*

6.1 Introduction to the built-in web interface

6.1.1 Overview

Use the built-in web interface of the SAILOR 900 VSAT ACU to make a full configuration of the SAILOR 900 VSAT with the correct VMU, the satellite positions you intend to use and other parameters.

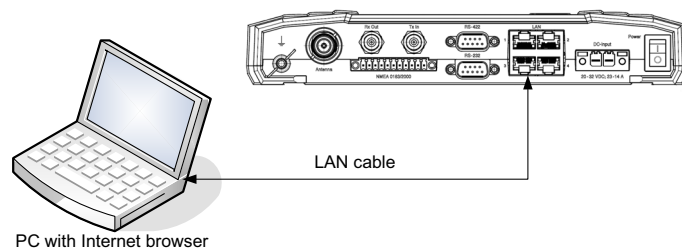


Figure 6-1: Configuration setup

For the rack version, connect the LAN cable to the front LAN connector of the ACU.

For quick start instructions see *Calibration of the SAILOR 900 VSAT* on page 6-4.

Note For information on daily use of the SAILOR 900 VSAT system refer to the SAILOR 900 VSAT Quick Guide or see chapter 8, *Daily use – Quick guide*.

No installation of software is necessary. The web interface is built into the SAILOR 900 VSAT ACU.

You access the web interface from a computer with a standard Internet browser.

6.1.2 Connecting to the web interface

To connect to the web interface of the ACU do as follows:

1. Power up the SAILOR 900 VSAT system, i.e. switch on the ACU. Wait until the LEDs on the front plate of the ACU show that the system is ready to be configured.
 - Power LED: Green
 - Logon LED: Off
 - Fail/Pass LED: Flashing green, during power-on self test, after that steady green.
2. Connect a PC to LAN interface 3 (Service port, standard Ethernet) of the ACU. For the rack version connect the LAN cable or to the front LAN connector of the ACU.

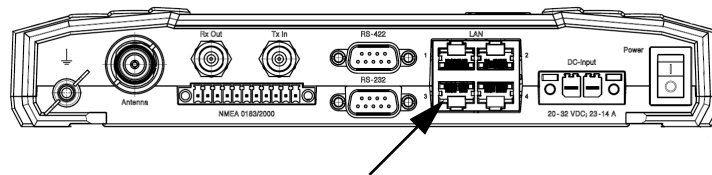


Figure 6-2: LAN connector used for configuring the SAILOR 900 VSAT

3. Open your Internet browser and enter the IP address of the ACU. The IP address is **http://192.168.0.1** (default).
4. The web interface opens directly with the **DASHBOARD** page.

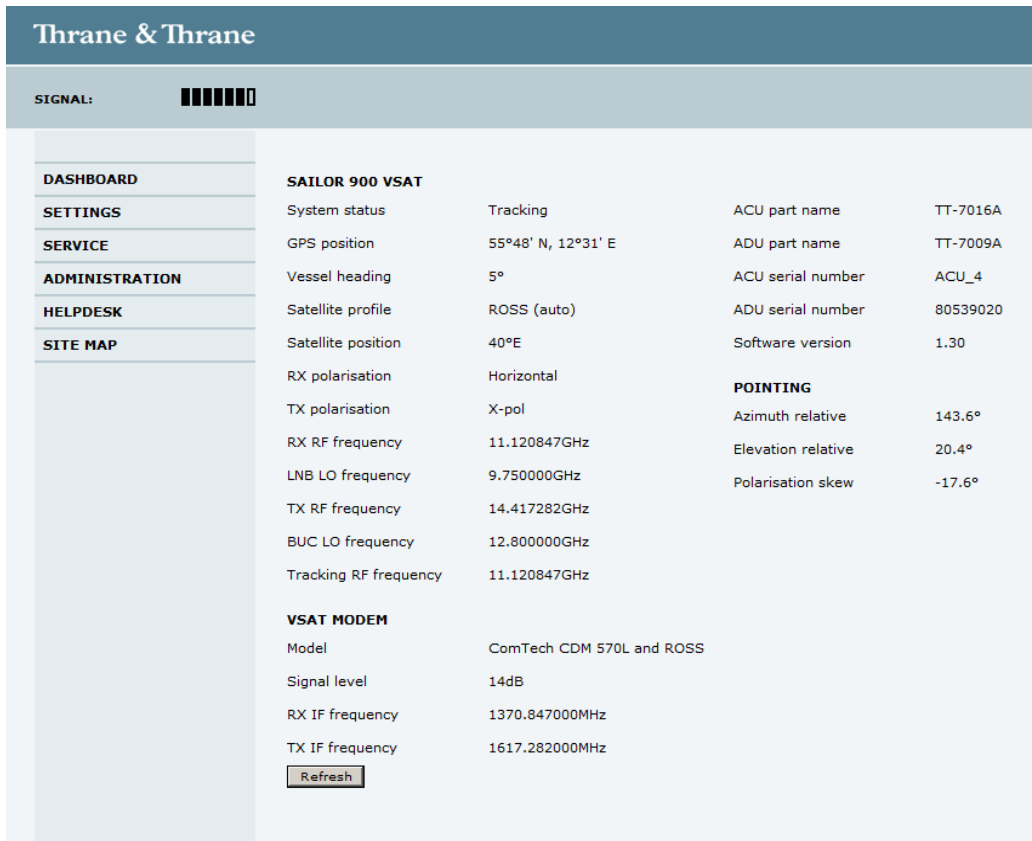


Figure 6-3: SAILOR 900 VSAT Dashboard

When the Dashboard is displayed you have verified that the connection to the SAILOR 900 VSAT can be established. The web interface is ready for use. You can continue to configure the system.

If you cannot establish a connection there might be problems with the Proxy server settings of your PC. See *Proxy server settings in your browser* on page 6-17 for further information. For a detailed introduction to the web interface see *Overview and navigation* on page 6-14.

If you want to use another LAN port you must configure it according to your network requirements. For information how to configure the LAN connectors see *Configuring the LAN network* on page 6-29.

6.2 Calibration of the SAILOR 900 VSAT

You must align the ADU with the vessel's gyro compass. To do this, you make an azimuth calibration, i.e. you determine the offset of the ADU zero direction to the bow-to-stern line of the ship. This procedure is fully automatic.

You can enter the satellite data for calibration directly on the calibration page or you can define a Service profile to be used in the calibration. After the calibration you create the satellite and VSAT modem profiles you want to use during normal operation, and you can set up blocking zones for the specific installation.

Important

You must logon as an administrator to do a calibration. See *Administration* on page 6-43.

For a detailed introduction to the web interface see *Overview and navigation* on page 6-14.

The following sections describe the steps for a successful calibration:

- *Preparing for calibration*
- *Heading and calibration of azimuth and cable*
- *Flow chart for azimuth and cable calibration*
- *Line up procedure*
- *SAILOR 900 VSAT fixed TX gain principle*

6.2.1 Preparing for calibration

To prepare for calibration you can set up a service profile for calibration. Use this approach if you do not want to enter the satellite parameters directly on the calibration page.

To setup a service profile do as follows:

1. Select **SETTINGS > Satellite profiles > New entry**. Enter the name of the satellite profile for calibration (a name of your own choice).
2. Select the VSAT modem profile **Service & Calibration** from the drop-down list.

Figure 6-4: Service profile for calibration

3. Enter the data for the satellite that you want to use as a calibration reference. For satellite data see *DVB-S satellites* on page E-1 or www.lyngsat.com. Make sure that the following requirements for the satellite are met:

Satellite requirements for successful calibration	
Elevation	Elevation angle: 5 – 70 degrees Not allowed for calibration: Inclined orbit.
System encryption	DVB-S or DVB-S2
RX Polarisation	Horizontal or vertical polarisation. Not allowed: Left-hand circular (L) or right-hand circular (R).
Symbol rate	The DVB symbol rate must be >5 Ms/s.
NID	Preferably a unique NID (ONID). An azimuth calibration without NID can be useful in regions where the satellite operators do not broadcast NID (US, China, Australia etc.). For NID=0 the NID is not used when checking the satellite link.

Table 6-1: Satellite requirements for elevation and carrier

Elevation cutoff: Not relevant for calibration.

- 4. Click **Apply** to save the settings for the service profile for calibration. The system is ready for the azimuth and cable calibration.

6.2.2 Heading and calibration of azimuth and cable

Access the page for heading and calibration through **SERVICE > Calibration**.

Thrane & Thrane

SIGNAL: 00000000

DASHBOARD

SETTINGS

SERVICE

Upload

Calibration

Line up

Dual antenna mode

XIM data

ADMINISTRATION

HELPPDESK

SITE MAP

CALIBRATION

Fixed heading

Enable☐

Vessel heading0.0°

Apply

Azimuth calibration

StatusCalibration ready

ResultUnknown

Azimuth calibration value-85.72°

SatelliteUser defined

Longitude0.8W

Pol skew0°

PolarisationHorizontal

Tracking frequency11.785 GHz

Symbol rate30 MS/s

Satellite identifierNID

NID70

StartCancel

Cable calibration

StartCancelRefresh

Figure 6-5: Web interface: SERVICE, Calibration

Note

If you do not want to enter the satellite data on the calibration page you can set up a service profile for calibration, see 6.2.1.

Check that the satellite transponder is visible from the location of the installation and at an elevation angle between 10 and 70 degrees.

6.2.2.1 Fixed heading

Do not use fixed heading for vessels! Use fixed heading only for fixed installations like remote areas or oil rigs, during training and test.

You can enable fixed heading and enter the fixed heading in degrees. Click **Apply**.

Note

If you change the heading settings you must make an azimuth calibration afterwards.

6.2.2.2 Azimuth calibration

Azimuth calibration is done toward a satellite of a known position. After finding the satellite, the system can calculate the azimuth offset of the ADU installation. The satellite and transponder properties for the calibration can be selected from a list of reference satellites or supplied manually. The calibration has 2 steps: Azimuth calibration and cable calibration.

There are 2 ways to make an azimuth calibration:

- Using a service profile.
- Using user defined input on the calibration page.

To make an azimuth calibration with a service profile, do as follows

1. Click **SERVICE > Calibration**.
2. Select the service profile in the drop down list, see *Preparing for calibration* on page 6-4. All profiles with the VSAT modem Service & Calibration are displayed in the list.

Important

Do not refresh the browser window during calibration, this will interrupt and restart the calibration procedure. The screen is not automatically updated when new data are available from the SAILOR 900 VSAT.

You may click the button **Refresh** in the web interface to update the screen.

3. Click **Start** in the section **Azimuth calibration** and wait typically 5 minutes for the calibration to finish. After finished calibration click the button **Refresh**. A message is displayed when the calibration has been completed.
4. Click **Start** below **Cable calibration** and wait typically 10 minutes for the calibration to finish. A message is displayed when the calibration has been completed successfully.

To make an azimuth calibration with user defined input, do as follows:

1. Select User defined in the Satellite drop down list.
2. Type in the longitude and polarisation skew of the satellite. The polarisation skew is provided by the satellite operator, it is typically 0 degrees. For satellite data see *DVB-S satellites* on page E-1, www.lyngsat.com.

Important

The calibration function is not able to verify the correctness or precision of the supplied longitude. It is therefore important to supply the correct longitude including the first decimal.

3. Select the polarisation of a transponder and type in its frequency and symbol rate.
4. Select which satellite identifier to use for identification of the signal.

Satellite identifier	NID value	Description
NID	0	Satellite identifier is not used.
NID	1–65534	Supplied NID is matched against Network ID broadcast by the satellite.
Orbital position	n.a.	Supplied longitude is matched with orbital position broadcast by satellite. Not all service providers broadcast the orbital position.

Table 6-2: Satellite identifier and NID values

5. Click **Start** and wait typically 5 minutes for the calibration to finish. A progress bar is shown during calibration and a message is displayed when the calibration has completed. In case of failure, see the table in the following section for a description of error codes during calibration.

Important

It is strongly recommended to verify the result of a calibration performed with user defined data. This can be done by making a new calibration on a different satellite and verify that the resulting Azimuth calibration value differs less than one degree.

6. Click **Start** below **Cable calibration** and wait typically 10 minutes for the calibration to finish. A message is displayed when the calibration has been completed successfully.

The following table shows the error codes that might be displayed during a calibration.

Error code	Explanation
1	The elevation of the selected satellite is too low. Select another satellite.
2	The elevation of the selected satellite is too high. Select another satellite.
4	The calibration values could not be saved. Possibly due to defective hardware.
5	The antenna could not point with sufficient precision. Check that the antenna is mounted in a stable way. Other possible causes might be electrical or mechanical faults.
6	No signal received. Check that there is free line of sight. Try again or try with another satellite.
7	RF setup error, e.g. missing or invalid TX frequency.
8	Invalid satellite, e.g. satellite not visible.

Table 6-3: Possible error codes during calibration

The SAILOR 900 VSAT is calibrated now. If the calibration failed there will be a message on the calibration screen.

6.2.3 Flow chart for azimuth and cable calibration

The following flow chart gives an example of an azimuth and cable calibration.

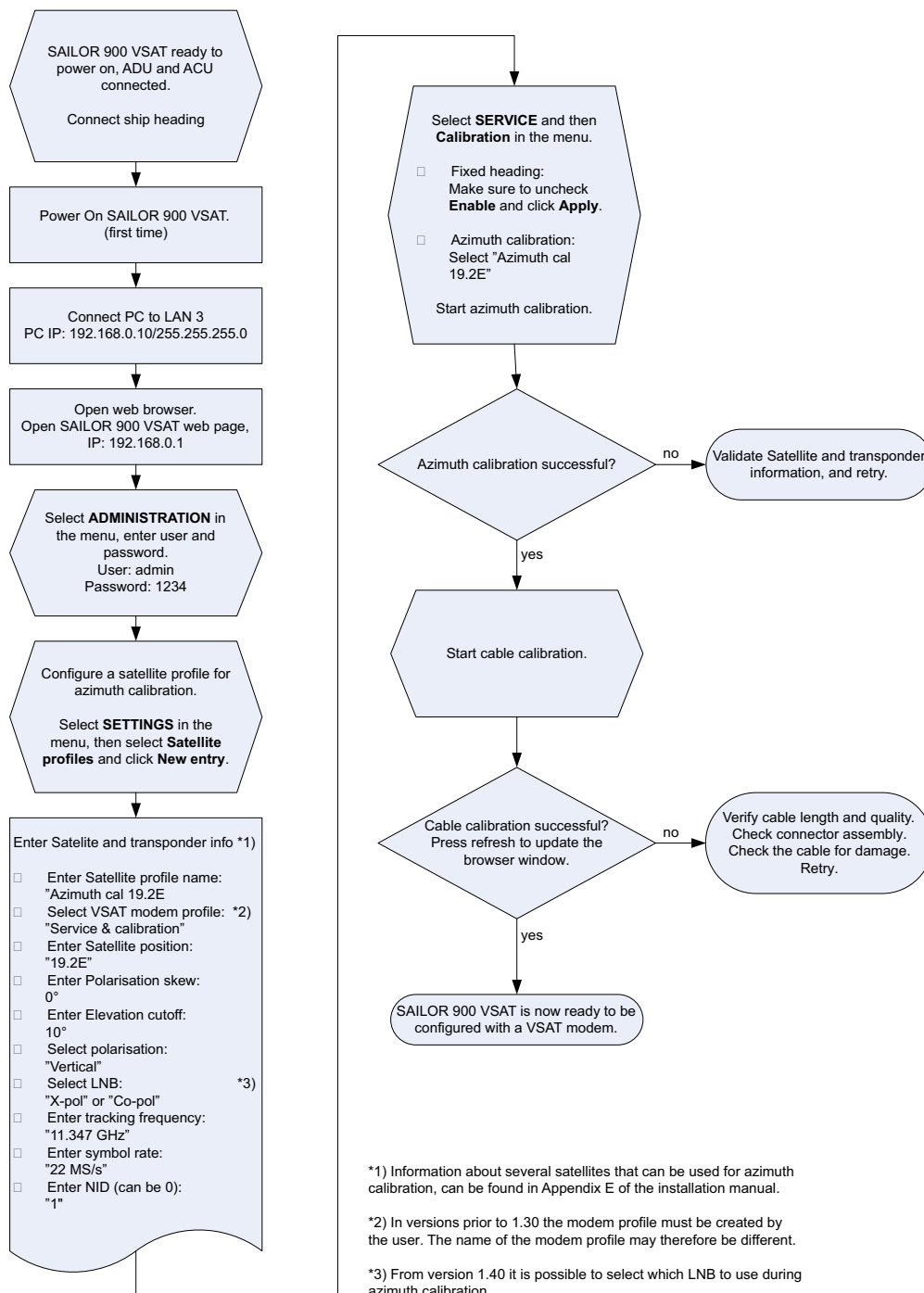


Figure 6-6: Example for azimuth and cable calibration – step by step

6.2.4 Line up procedure

Note | The ship must not move during the calibration procedure.

The SAILOR 900 has been tested at factory online on a live satellite link to calibrate the TX polarisation unit. You can fine-tune the TX polarization by doing a line up as described below. To do the line up, do as follows:

1. Open the web interface of the SAILOR 900, for instructions see *Connecting to the web interface* on page 6-2.
2. Create a VSAT modem profile and a satellite profile using the previously created VSAT modem profile (See *Preparing for calibration* on page 6-4).
3. Go to the page **SERVICE > Line up**. As soon as the antenna is in tracking mode and points to the satellite, the text next to **Status** shows **Please wait. Improving tracking**. This may take up to 2 minutes. Wait until the text shows **Ready for activation**.

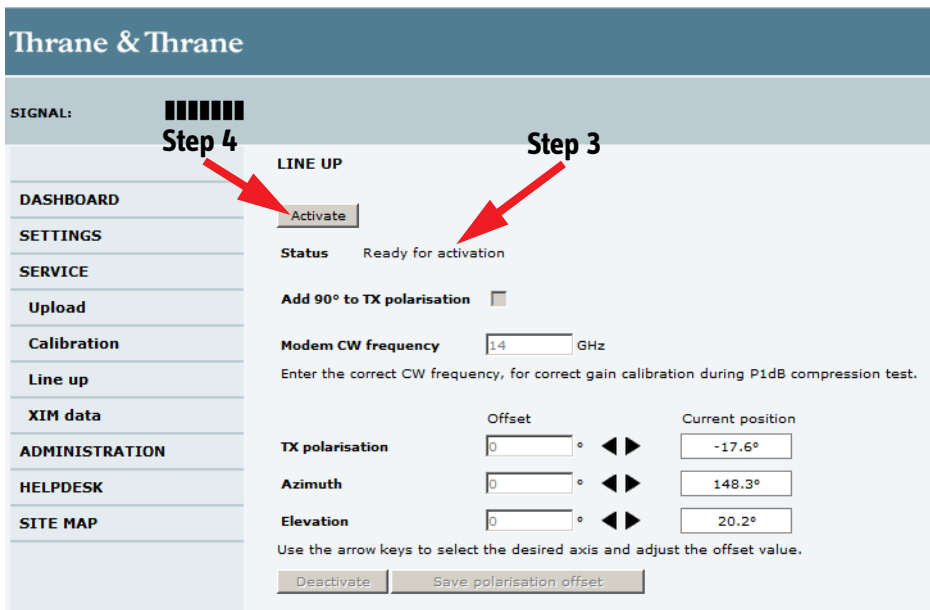


Figure 6-7: Web interface: SERVICE, Line up: Ready for activation

4. Click the button **Activate** and wait until the status field shows **Antenna ready**. Follow the instructions from your service provider.

Thrane & Thrane

SIGNAL: ■■■■■■

DASHBOARD

SETTINGS

SERVICE

Upload

Calibration

Line up

XIM data

ADMINISTRATION

HELPDESK

SITE MAP

LINE UP

Activate

Status Antenna ready

Add 90° to TX polarisation ☒

Modem CW frequency GHz
Enter the correct CW frequency, for correct gain calibration during P1dB compression test.

	Offset	Current position
TX polarisation	<input type="text" value="0.3"/> °	<input type="text" value="72.7"/> °
Azimuth	<input type="text" value="0.0"/> °	<input type="text" value="145.3"/> °
Elevation	<input type="text" value="0.0"/> °	<input type="text" value="21.1"/> °

Use the arrow keys to select the desired axis and adjust the offset value.

Deactivate **Save polarisation offset**

Figure 6-8: Web interface: SERVICE, Line up: Antenna ready

5. Enter the Modem CW frequency (Continuous Wave) in GHz. This is provided by the satellite operator, typically when talking to the satellite operator on the phone before starting the line up.
6. Adjust the TX polarisation as instructed by the service provider. If needed, add 90 degrees to the TX polarisation by selecting the field.
7. Set the values as advised by the service provider:
 - TX polarisation
 - Azimuth
 - Elevation
8. To save the TX polarisation offset value, click the button **Save polarisation offset**.
9. Follow the instructions from the service provider to make a P1dB compression test (VSAT modem).
10. Click the button **Deactivate** to finish the line up procedure.

When finished, the saved value for TX polarisation is visible the next time the line up procedure is selected.

6.2.5 SAILOR 900 VSAT fixed TX gain principle

The SAILOR 900 VSAT uses a new transmitter chain concept. After calibration it provides a fixed gain of 44 dB from the Tx-port of the ACU to the output of the BUC. Advantages of the fixed TX gain principle are:

- Fixed TX gain over frequency and cable length
- TX gain independent of antenna cable length
- Utilization of the full 8W BUC power over frequency
- P1dB compression point the same over frequency

When installing the SAILOR 900 VSAT you make a cable calibration. At that point every installation finds the same P1dB compression setting regardless of cable length. The P1dB compression point is approximately -5 dBm at the ACU Tx-port. Additionally the SAILOR 900 VSAT system monitors the TX gain in real time.

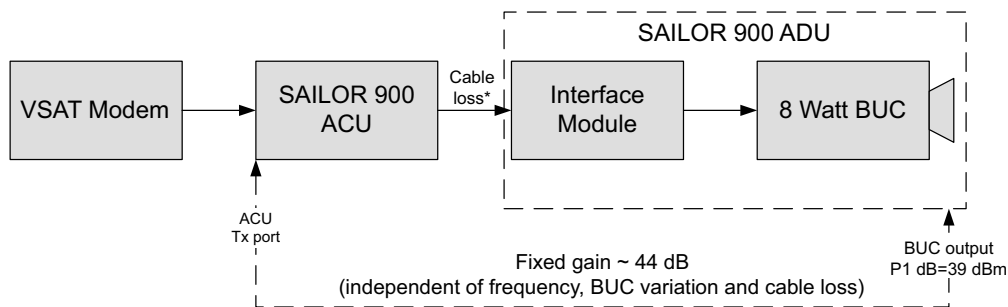


Figure 6-9: Fixed TX gain principle

* You find the maximum cable loss at *Maximum allowed RF loss in the ADU cable* on page 3-22.

Example: ACU Tx-port power: -5dBm > BUC output = +39 dBm (compression)

6.3 Configuration with the web interface

6.3.1 Overview and navigation

6.3.1.1 Topics in the web interface

Use the site map to get an overview over the existing menus, submenus and topics. You can click on each menu in the site map to go directly to the page or display the respective submenu.

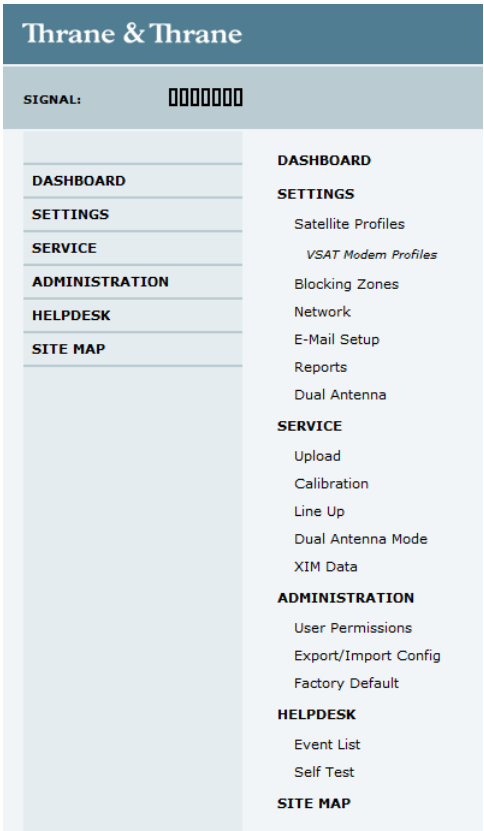


Figure 6-10: Topics in the web interface (SITE MAP)

Software version 1.30 is the version described in this chapter.

6.3.1.2 Navigation

The web interface consists of the following sections:

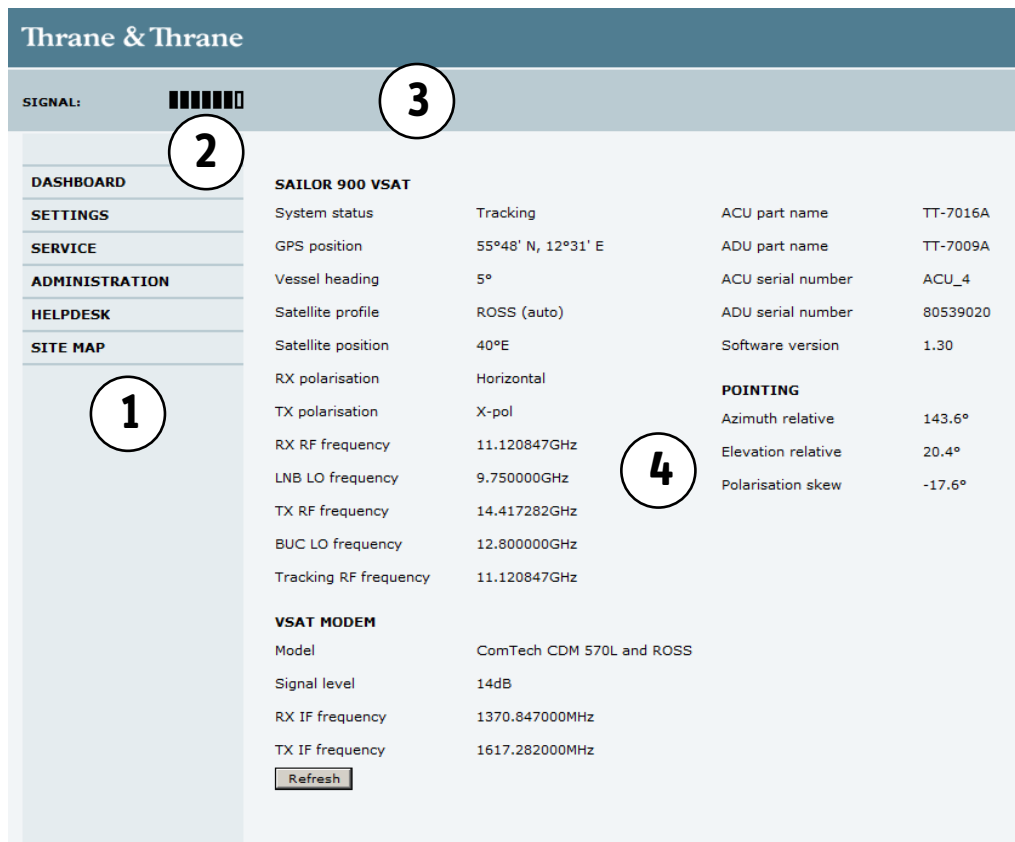


Figure 6-11: Sections of the web interface

1. The **navigation pane** holds the main menu. Clicking an item in the menu opens a submenu in the navigation pane or a new page in the contents section.
2. The **signal status field** shows the signal strength. The signal strength can vary during operation, depending on the current position relative to the satellite.
3. The **icon bar** shows icons for active events, when relevant. For explanations of the icons, see the next section, *Icons in the icon bar*.
4. The **contents section** shows the page selected in the navigation pane. This section is used for viewing or changing settings, or for performing actions.

6.3.1.3 Icons in the icon bar

The following icons may appear in the icon bar in the web interface:


Icon	Explanation
	An event is active. Click the icon to see a list of active events. For explanations of the event messages, see <i>Event list</i> on page 9-3 and <i>Event messages – overview</i> on page G-1. Note that this icon will remain in the icon bar as long as the event is active.

Table 6-4: Web interface: Event icon

6.3.1.4 Navigating the web interface

- **To expand a menu**, click the menu in the navigation pane.
- **To access status and settings**, click the relevant subject in the navigation pane or click the relevant icon in the icon bar. The status or settings are displayed in the contents section.
- **To get an overview over the submenus available use the site map**, click **SITE MAP** in the navigation pane. Click on items in the site map to go directly to the relevant location.

Note You can give access to some configuration settings for users that are not administrators. For information on how to set up user permissions, see *Setting up user permissions* on page 6-45.

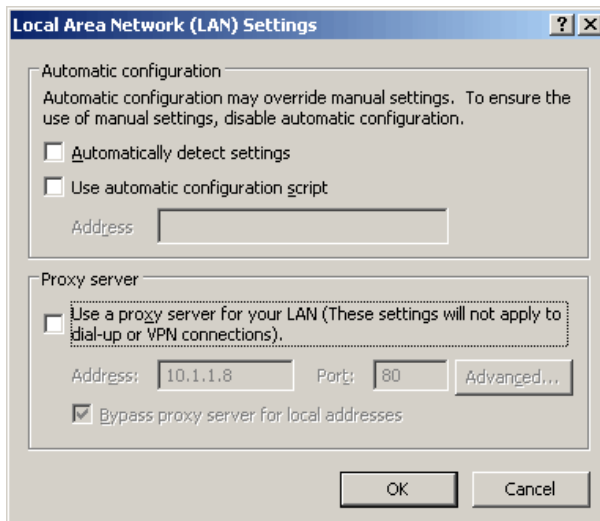
6.3.1.5 Proxy server settings in your browser

If you are connecting your computer using a LAN or WLAN interface, the **Proxy server** settings in your browser must be disabled before accessing the web interface. Most browsers support disabling of the Proxy server settings for one specific IP address, so you can disable Proxy server settings for the web interface only, if you wish. Consult your browser help for information.

To disable the use of a Proxy server completely, do as follows:

Note The following description is for **Microsoft Internet Explorer**. If you are using a different browser, the procedure may be different.

1. In Microsoft Internet Explorer, select **Tools > Internet Options > Connections > LAN Settings**.



2. Clear the box labeled **Use a proxy server for your LAN**.
3. Click **OK**.

When the proxy server settings are disabled, close and restart your browser.

You may need to change this setting back on return to your Internet connection.

6.3.1.6 Connecting a PC

To connect your PC to the ACU see *Connecting to the web interface* on page 6-2. If you want to use another LAN port than LAN 3 you must configure it according to your network requirements. For information how to configure the 4 LAN connectors see *Configuring the LAN network* on page 6-29.

6.3.2 Using the Dashboard

The Dashboard is the first screen that is displayed when the user or administrator enters the IP address of the web interface of the ACU. The Dashboard is used for viewing properties and status of the ACU and ADU.

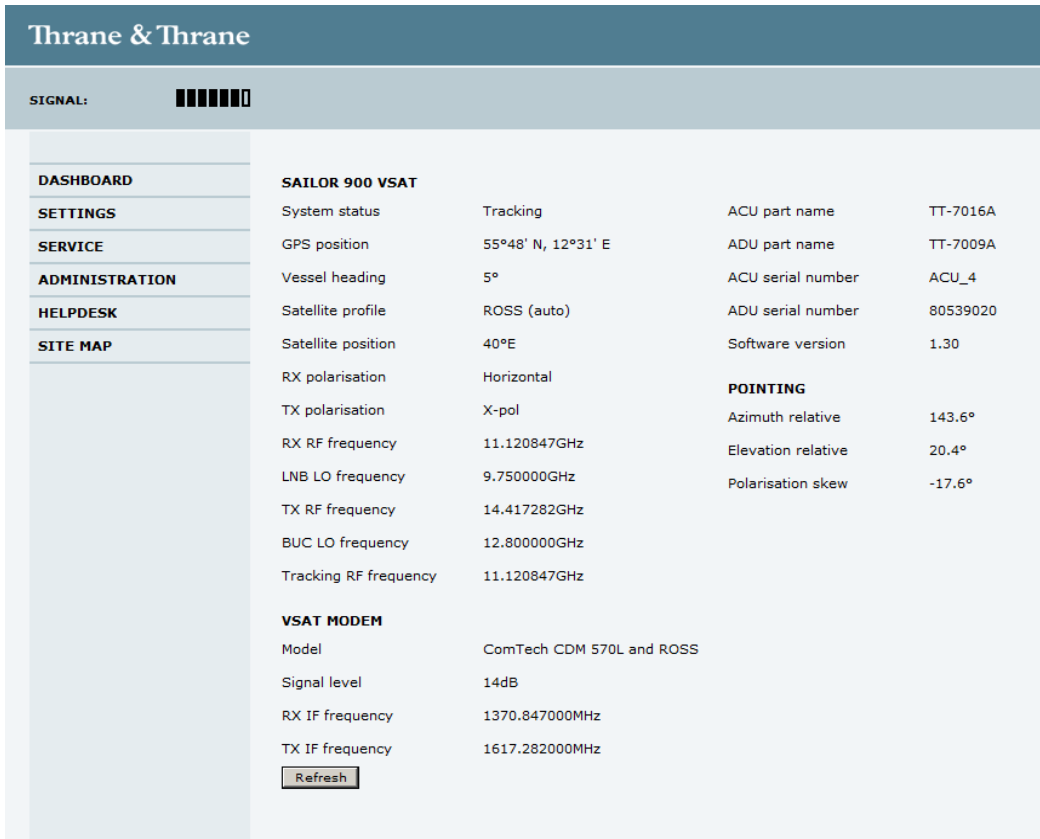


Figure 6-12: Web interface: DASHBOARD

6.3.2.1 Information fields on the Dashboard

SAILOR 900 VSAT parameter	Description
System status	<p>Current status of the SAILOR 900 VSAT.</p> <p>Examples:</p> <p>Not ready (waiting for input from GNSS, e.g. GPS)</p> <p>Ready (waiting for data from the VSAT modem or no satellite profile selected)</p> <p>Pointing antenna (locating the satellite)</p> <p>Acquiring signal (acquiring the satellite signal)</p> <p>Tracking (tracks the current satellite)</p> <p>No Tx zone (antenna is pointing in a no TX zone; TX is off)</p> <p>Blocking zone (antenna is pointing into a blocking zone)</p> <p>Service switch (service switch in ADU activated)</p> <p>Safe mode (error, followed by an error description)</p>
GPS position	Current position of the vessel, reported by the GPS module
Vessel heading	Ship's heading in degrees with reference to North, provided by the ship's gyro.
Satellite profile	Name of the currently active satellite profile.
Satellite position	Position of the satellite selected in Satellite profile.
RX polarisation	Horizontal or vertical.
TX polarisation ^a	Co-pol or X-pol, auto-selected by VSAT modem
RX RF frequency ^a	Ku band receiving frequency, auto-selected by VSAT modem
LNB Lo frequency ^a	Auto-selected by VSAT modem
TX RF frequency ^a	Auto-selected by VSAT modem
BUC Lo frequency	12.8 GHz (system parameter)
Tracking RF frequency	Currently tracking RF frequency.
ACU part name, ADU part name, ACU serial number, ADU serial number, Software version	Part names, serial numbers for ACU and ADU, software version of the SAILOR 900 VSAT.

Table 6-5: Web interface, DASHBOARD, SAILOR 900 VSAT parameters

a. Can be altered when using a generic modem profile.

VSAT MODEM parameter	Description
Signal level	Current input signal level from VSAT modem. iDirect openAMIP modem: (PWR) 0-500, delivered by the connected modem. For values <250 the antenna searches after a new signal. Other modem: Signal level in dB.
RX IF frequency	Read out from VMU.
TX IF frequency	Read out from VMU.
Model	VSAT modem name, entered in SETTINGS > VSAT modem profiles .

Table 6-6: Web interface, DASHBOARD, VSAT MODEM parameter

POINTING parameter	Description
Azimuth relative	Current value for azimuth, relative to the vessel heading.
Elevation relative	Current value for elevation, relative to the vessel.
Polarisation skew	Current value for polarisation skew.

Table 6-7: Web interface, DASHBOARD, POINTING parameter

6.3.3 Satellite profiles and VSAT modem profiles

6.3.3.1 Satellite profiles

On the page **Satellite profiles** you add, edit and delete satellite profiles. A satellite profile contains all settings that are necessary for a successful connection to the satellite, including a VSAT modem profile. Most of the data you have to fill in are provided by your VSAT service provider.

You must activate one satellite profile.

Note

You must add at least one VSAT modem profile before you can add a satellite profile. See *VSAT modem profile – New entry and Edit* on page 6-24.



Thrane & Thrane		
SIGNAL: ■■■■■■		
DASHBOARD	SATELLITE PROFILES	
SETTINGS	Name▼	Position▼
Satellite profiles	7E W3A Eutelsat	7° E Edit / Delete / Activate
VSAT modem profiles	15W Telstar 12	15° W Edit / Re-activate
Blocking zones	New entry	
Network		
E-mail setup		
Reports		
SERVICE		
ADMINISTRATION		

Figure 6-13: Web interface: SETTINGS - list of satellite profiles (example)

6.3.3.2 Satellite profiles – New entry and Edit

Each satellite profile has one assigned VSAT modem profile.

Figure 6-14: Web interface: SETTINGS, Satellite profiles – new entry (example)

To add or edit a satellite profile, do as follows:

1. Go to **SETTINGS** or **Satellite profiles** and click **Edit** or **New entry**.
2. Enter or edit the Satellite profile name.

Note

It is helpful to assign a name containing the location where the Satellite profile is to be used (e.g. "Gulf of Mexico" or "North Sea") and possibly the provider.

3. Select a VSAT modem profile. The page automatically displays the parameters available for the selected VSAT modem profile. For instruction how to add a VSAT modem profile see *VSAT modem profile – New entry and Edit* on page 6-24.
4. Enter the data for the satellite that you want to use. For satellite data see *DVB-S satellites* on page E-1 or www.lyngsat.com.
5. Polarisation skew: See documents from VSAT provider.

6. At Elevation cutoff enter the minimum elevation angle for the antenna to function in accordance with ETSI (ETSI EN 302 340) and FCC (FCC §25.205) regulations.

- **ETSI (ETSI EN 302 340):** The minimum elevation angle depends on the Tx bandwidth and the nominal power of the VSAT modem, see the table below.

Bandwidth	Nominal VSAT modem power								
	-22 dBm	-20 dBm	-18 dBm	-16 dBm	-14 dBm	-12 dBm	-10 dBm	-8 dBm	-6 dBm
Eirp@14.25 GHz ^a	63.4 dBm	65.4 dBm	67.4 dBm	69.4 dBm	71.4 dBm	73.4 dBm	75.4 dBm	77.4 dBm	79.4 dBm
64 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
128 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
256 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
512 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
1024 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
2048 kHz	3°	3°	3°	4°	5°	5°	6°	8°	9°
4096 kHz	3°	3°	3°	3°	4°	4°	5°	6°	7°
8192 kHz	3°	3°	3°	3°	3°	3°	4°	5°	5°
16384 kHz	3°	3°	3°	3°	3°	3°	3°	4°	4°
32768 kHz	3°	3°	3°	3°	3°	3°	3°	3°	3°

Table 6-8: Elevation cutoff (in degrees) versus VSAT modem bandwidth and power

- a. Eirp = Fixed system gain 44 dB + antenna gain @ 14.25 GHz 41.4 dB + modem power

- **FCC (FCC §25.205):** 5 degrees

7. Click **Apply** to save the settings for the satellite profile.

6.3.3.3 VSAT modem profiles

A VSAT modem profile contains all VSAT modem settings that are necessary for a successful connection to the satellite. The data you have to fill in are provided by your VSAT service and modem provider. You must add at least one VSAT modem profile.

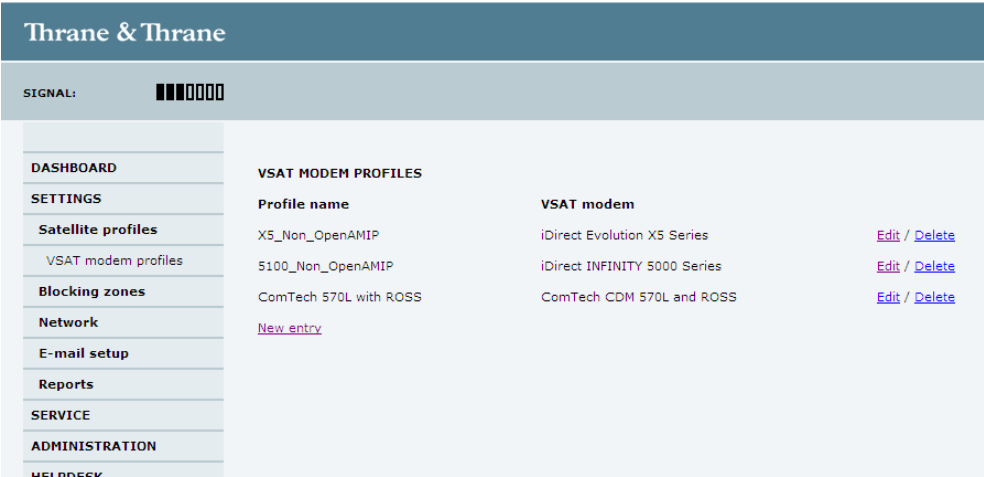


Figure 6-15: Web interface: SETTINGS, VSAT modem profiles – list (example)

To create a new VSAT modem satellite profile, click **New entry**. To edit or delete a VSAT modem profile, click **Edit** or **Delete**.

6.3.3.4 VSAT modem profile – New entry and Edit

On the page **VSAT modem profiles** you create, edit or delete VSAT modem profiles. The supported VSAT modem profiles are listed in the drop-down list **VSAT modem profile**. The VSAT modem named Service is a modem profile used during azimuth calibration.

To add or edit a VSAT modem profile, do as follows:

1. Go to **SETTINGS > VSAT modem profiles** and click **New entry** or **Edit**.

Figure 6-16: Web interface: SETTINGS, VSAT modem profiles – new entry (example)

2. Fill in a VSAT modem profile name of your own choice.
3. Select one of the supported VSAT modems from the drop down list. The following VSAT modem profiles are supported:

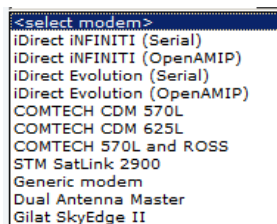


Figure 6-17: Supported VSAT modems in software version 1.30

Generic modem: If you have a modem that is not included in the list, select the generic modem. This is mainly used for troubleshooting purposes.

4. Fill in or edit the data provided by your VSAT service provider.
Enter the passwords, if needed.
Select the VSAT modem baud rate and whether you want to use the 10 MHz reference from the ACU or the VSAT modem.

Important

The SAILOR 900 VSAT can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem.

For OpenAMIP IP address: Make sure that you have entered this IP address also for the LAN connector that is used for the OpenAMIP modem, see *Configuring the LAN network* on page 6-

29.

5. Click **Apply** to add the new profile to the list of VSAT modem profiles or to accept the edits.

For a generic modem you enter all parameters in the satellite profile.

The screenshot shows a web form titled "ADD SATELLITE PROFILE". At the top, there are two text input fields: "Satellite profile name" with the value "Satellite prof. w generic modem" and "VSAT modem profile" with a dropdown menu showing "Profile with generic modem". Below these are "Apply" and "Cancel" buttons. A horizontal line separates this section from the main configuration area. The main area contains several fields: "Satellite position" (0 E), "Polarisation skew" (0), "Maximum inclination" (0), "RX polarisation" (radio buttons for Horizontal and Vertical, with Horizontal selected), "TX polarisation" (radio buttons for Co-pol and X-pol, with Co-pol selected), "RX IF frequency" (0 MHz), "LNB LO frequency" (9.75 GHz dropdown), "RX RF frequency" (0 GHz), and "TX RF frequency" (0 GHz). A section titled "Tracking" follows, with "RX frequency" (radio buttons for VSAT modem and User defined, with VSAT modem selected) and a frequency input (0 GHz). Below this are radio buttons for "DVB-S / DVB-S2", "DVB power", "Narrow band" (selected), and "VSAT modem RSSI". At the bottom are "Apply" and "Cancel" buttons.

Figure 6-18: Satellite profile for generic modem

6.3.4 Setting up Blocking zones (RX and TX)

On this page you define blocking zones, i.e. NO TX and RX zones, enter azimuth values and elevation angles for each blocking zone.

You must select **Active** to enable a blocking zone.

Thrane & Thrane

SIGNAL: 00000000

DASHBOARD

SETTINGS

Satellite profiles

Blocking zones

Network

E-mail setup

Reports

SERVICE

ADMINISTRATION

HELPDESK

SITE MAP

BLOCKING ZONES

Active	Azimuth	Elevation	No TX
<input checked="" type="checkbox"/>	264° - 297°	-25° - 12°	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	264° - 281°	-25° - 22°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 360°	-25° - 90°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 10°	0° - 10°	<input type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input type="checkbox"/>

Apply Cancel

Figure 6-19: Web interface: SETTINGS, Blocking zones – azimuth and elevation

To define and set a blocking zone, do as follows:

1. Select **SETTINGS > Blocking zones**.
2. Select **Active** to enable the blocking zone.

3. **Azimuth:** Enter start and stop azimuth value in degrees for the blocking zone. Values allowed: 0 to 360 degrees. Enter clockwise.

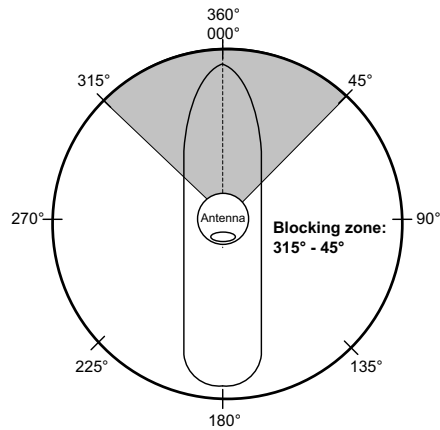


Figure 6-20: Blocking zone, example: 315 - 45 degrees

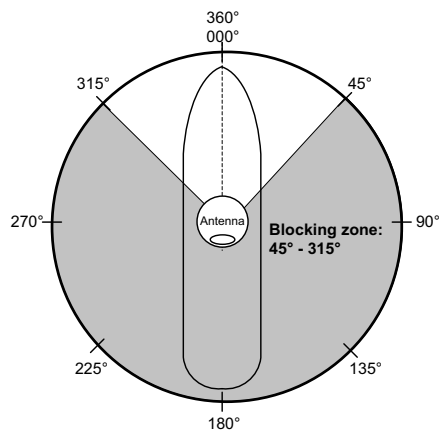


Figure 6-21: Blocking zone, example: 45 - 315 degrees

4. **Elevation:** Enter the start and stop elevation angle for the blocking zone. If you enter nothing, there will be no blocking zone. Values allowed: -30 to 90 degrees.

Important You must enter 2 different elevation angles to have an active blocking zone.

5. Select **No TX** for zones if you don't want the system to transmit. If not selected, the system also transmits when pointing through areas with blocking objects. The VSAT modem will shut off for TX if no signal is received.
6. Click **Apply** to save the blocking zones.

6.3.5 Configuring the LAN network

You can enter a host name. The host name helps identifying the SAILOR 900 VSAT system when sending e-mail reports. The ACU has four 10/100 Mbit Ethernet ports labelled LAN port 1, 2, 3 and 4. The ports are divided in three groups, each operating in its own network. You can setup DNS and Gateway.

To configure the LAN network go to **SETTINGS > Network**.

NETWORK

Host name:

LAN port 1: VSAT Modem Unit

Mode: ☒ Static IP ☐ DHCP client

IP address:

Netmask:

DHCP Server: ☐

DHCP Server Start:

DHCP Server End:

LAN port 2: LAN

Mode: ☐ Static IP ☒ DHCP client

Switched network with LAN port 1

LAN port 3: Service

Mode: ☐ Static IP ☒ DHCP client

IP address:

Netmask:

DHCP Server: ☒

DHCP Server Start:

DHCP Server End:

LAN port 4: LAN

Mode: ☐ Static IP ☒ DHCP client

IP address:

Netmask:

DNS setup

DNS source:

Primary DNS:

Secondary DNS:

Gateway setup

Default gateway source:

Default gateway:

Zeroconf setup

Zeroconf source:

Figure 6-22: Web interface: SETTINGS, Network (default settings)

Important

Make sure that the 3 networks do not use IP address ranges that overlap.

Sections	Preferred use
NETWORK Host name	The host name is used for identifying the ACU in local networks and in e-mail reports. The default host name is acu. You can change the name. Letters (a-z), digits (0-9) and hyphen (-) are allowed as legal characters. Note: The host name must start with a letter.
LANPort1 + 2	LAN port 1 and 2 are switched, i.e. they share the same IP address and operate on the same network. This network is usually connected to the VSAT Modem Unit. LAN port 1 can be set to static IP (default), DHCP client or DHCP server. IMPORTANT – OpenAMIP IP modem: Make sure that you have entered this IP address also for the VSAT modem profile of the OpenAMIP modem, see <i>VSAT modem profile – New entry and Edit</i> on page 6-24.
LAN Port 3	LAN port 3 is dedicated as the service port. By default this port has the IP address 192.168.0.1; the current value can be displayed in the ACU display. In a 19" rack mount it is recommended to connect LAN port 3 to the front port (via rear connector, see the figure <i>ACU rack version, connector panel overview</i> on page 4-2), for access to the service port from the rack front. LAN port 3 can be set to static IP, DHCP client or DHCP server (default).
LAN Port 4	LAN port 4 can be used for connection to the LAN of the vessel or other general purpose. LAN port 4 can be set to static IP, DHCP client (default) or DHCP server.

Table 6-9: Setup of LAN connectors

6.3.5.1 Static IP or DHCP Client

If you select **DHCP client** the network IP address and sub-net mask must be provided by a DHCP server on that network.

If you select **Static IP** address you must specify a unique IP address and a sub-net mask.

6.3.5.2 DHCP Server Settings.

On LAN ports 1,3 and 4 you can choose to run a DHCP server. Select the check box **DHCP Server**. The DHCP server settings are only displayed and can be selected when the port mode is set to **Static IP**, otherwise the DHCP server settings are not shown.

The DHCP start and end addresses must be on the same network as the port's static IP.

6.3.5.3 DNS setup

If you have access to a Domain Name Server (DNS) you can specify the address of the e-mail server by using the server name instead of its IP address. This can be used in **Outgoing mail server** in *E-mail setup* on page 6-32.

You may statically specify the address of one or two DNS. Select the DNS source as static and fill in IP address or addresses.

Alternatively, if your DHCP server can provide a DNS address and you have selected DHCP client above, then select the same LAN as your DNS source.

6.3.5.4 Gateway setup

If the ACU needs to communicate with network units outside the specified sub-nets, you must specify a default gateway (typically a router).

The default gateway can be set as a static IP address. Then set the default gateway source to static and enter the IP address of the default gateway. To remove the default gateway set it to 0.0.0.0.

Alternatively, if your DHCP server is able to provide a default gateway address and you have selected DHCP client above, then select the same LAN as your default gateway source.

6.3.5.5 Zeroconf Settings

On LAN ports 1,3 and 4 you can choose to add a zeroconf address in the network (169.254.0.0/24). This zeroconf address will be in addition to the existing static or DHCP IP address. One port at a time can be enabled.

Zeroconf allows devices to connect to a network automatically.

6.3.6 E-mail setup

To be able to send diagnostics and statistics reports using e-mail you must set up a couple of parameters. Contact your IT department for the specific data.

To configure the e-mail setup, do the following:

1. Go to **SETTINGS > E-mail setup**.

The screenshot shows the 'Thrane & Thrane' web interface. At the top, there's a header with the company name and a signal strength indicator. Below the header is a sidebar menu with options: DASHBOARD, SETTINGS, Satellite profiles, Blocking zones, Network, E-mail setup (highlighted), Reports, SERVICE, ADMINISTRATION, HELPDESK, and SITE MAP. The main content area is titled 'E-MAIL SETUP' and contains the following fields: 'Outgoing mail server (SMTP)' with the value '10.1.6.99', 'SMTP port number' with the value '25', 'SMTP authentication' with radio buttons for 'None' (selected) and 'Credentials', 'User name' (empty), and 'Password' (empty). At the bottom of the form are 'Apply' and 'Cancel' buttons.

Figure 6-23: Web interface: SETTINGS, E-mail setup (example)

2. Enter the data for Outgoing mail server (SMTP), SMTP port number, SMTP authentication, User name and password. This data is typically provided by your IT department.

Note

You must set **Outgoing mail server** to an IP address if DNS has not been set up in **DNS setup** in *Configuring the LAN network* on page 6-29.

6.3.7 Sending statistics reports

SAILOR 900 VSAT can send a statistics report at fixed intervals. This report contains historical information from the SAILOR 900 VSAT of up to 1 month. It is sent as a zipped attachment to an e-mail. The file format is a comma separated value file (csv). The report can then be processed in spreadsheet applications, e.g. Microsoft Excel.

Figure 6-24: Web interface: SETTINGS, Reports (example)

To set up sending a statistics report, do as follows:

1. Configure e-mail first, see *E-mail setup* on page 6-32.
2. Go to **SETTINGS > Reports**.
3. In the section **STATISTICS REPORT** enter the following:
 - Sender e-mail address, this address will be the e-mail address from sending the report.
 - List of recipients (comma separated).
 - Send the report each: Select disabled, day (default) with 2-minute samples, week with hourly samples or month with hourly samples. The report contains statistics data for the selected.
4. Click **Apply**.

You can also send the report at any time by clicking **Send now** or download it directly to your computer by clicking **Download**. You can select statistics for the day, week or month. Use **Send now** to validate the e-mail setup.

The following parameters are recorded in the statistics report:

Parameter recorded	Description
Hostname	Host name, entered in the web interface on the page SETTINGS > Network.
ACU SN	ACU serial number
ADU SN	ADU serial number
SW ver.	Software version
System type	SAILOR 900 VSAT or SAILOR 100 Satellite TV

Table 6-10: Statistics report, header record

Parameter recorded	Description
UTC. (s) UTC (YYYY-MM-DD hh:mm)	UTC in seconds and date format for the data set.
RSSI.Av RSSI.Max RSSI.Min	Received signal strength (average, maximum and minimum value) for the sampling interval.
POS.Lat (degree) POS.Long (degree) POS.Valid	Latitude value of position. Longitude value of position. Fix = valid position, No Fix = invalid position.
Heading.Samp (degree) Heading.Max (degree) Heading.Min (degree) Heading.Range (+/-degree)	Ship's heading (sample, maximum and minimum value, range) for the sampling interval. See Figure 6-25: <i>Statistics – how to read data for a range.</i>
Antenna.Azi (degree) Antenna.Azi Max (degree) Antenna.Azi Min (degree) Antenna.Azi Range (+/-degree)	Current antenna azimuth (sample, maximum and minimum value, range) for the sampling interval. See Figure 6-25: <i>Statistics – how to read data for a range.</i>
Antenna.Ele (+/-degree) Antenna.Ele Max (+/-degree) Antenna.Ele Min (+/-degree)	Current antenna elevation (sample, maximum and minimum value) for the sampling interval.
Vsat.rx_lo_freq (GHz) Vsat.tx_lo_freq (GHz)	Rx frequency of VSAT modem for this record. Tx frequency of VSAT modem for this record.
Tracking.rf freq (GHz) Tracking.type	Tracking RF frequency for this record. Narrow filter, DVB-S2 decoder and VSAT modem RSSI.
Sat.long (degree)	Longitude position of the satellite.

Table 6-11: Parameters recorded in a statistics report

Parameter recorded	Description
Carrier rf.rx (GHz) Carrier rf.tx (GHz)	Rx frequency of carrier for this record. Tx frequency of carrier for this record.
Rx Lock (%) Logon (%)	Rx locked and logon time, in percent, for the sampling interval.
Pos Ok (%)	Valid position, in percent of the sampling interval.
VMU Connection (%)	Link with VSAT modem, in percent of the sampling interval.
Blocking (%)	Ship in blocking zone, in percent of the sampling interval.
DualAntenna.mode DualAntenna.logon_remote (%) DualAntenna.active (%)	Shows the current mode and the time active and remote logon.

Table 6-11: Parameters recorded in a statistics report (Continued)

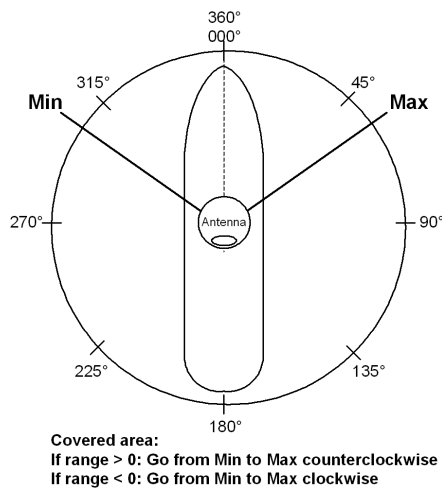


Figure 6-25: Statistics – how to read data for a range

6.3.7.1 Processing the statistics report in a spreadsheet application

The statistics report is in a data format that can be imported into spreadsheet applications, e.g. Microsoft Excel, for further processing.

1. Save the zipped file to your computer and extract the text file. The file name contains the identification of the system (example: adu-acu3_stat_20111021110901_day.csv).

2. Open the spreadsheet application, for example Microsoft Excel. On the tab Data click the tab Import from text. Import the unzipped text file and follow the instructions in the wizard. When asked about the delimiter, select 'comma'.

The following figure shows an example of a statistics report in MS Excel 2007.

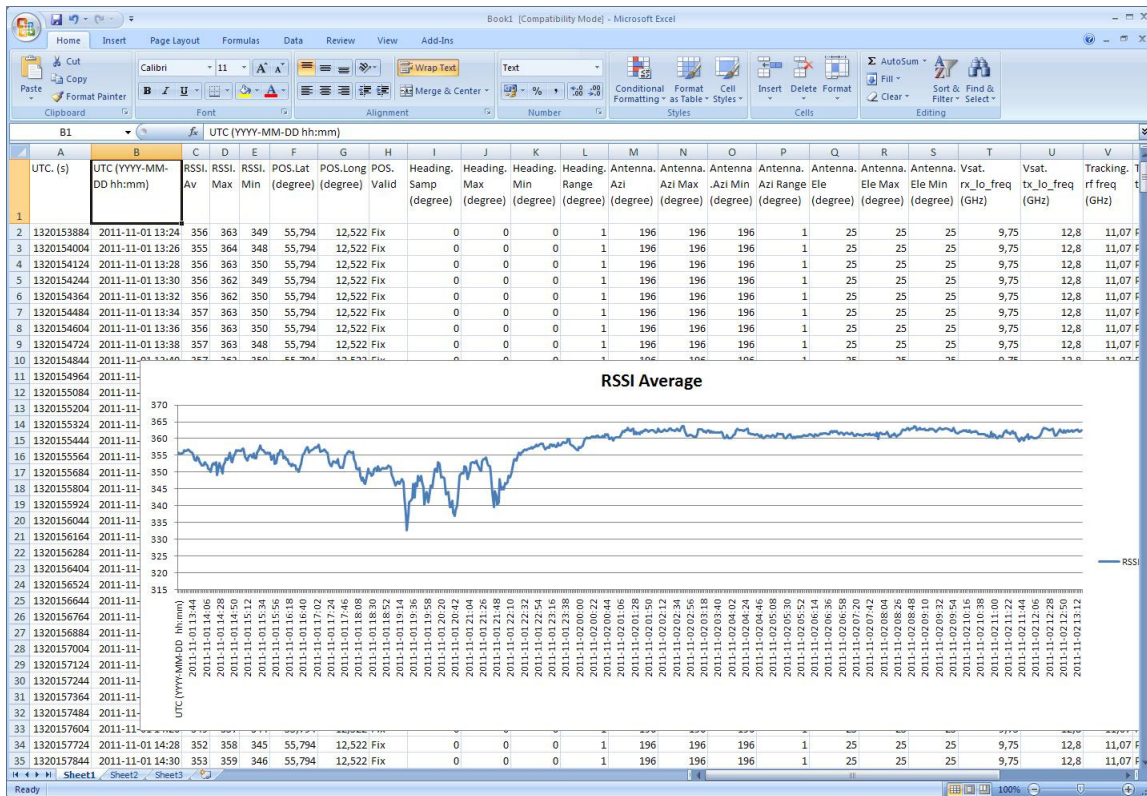


Figure 6-26: Statistics report (example)

6.3.8 Sending a diagnostics report

You can send automatically generated diagnostic reports at fixed intervals. The diagnostic report contains information relevant for the service personnel during troubleshooting.

To set up sending a statistics report, do as follows:

1. Go to **SETTINGS > Reports**.
2. In the section **DIAGNOSTICS REPORT** enter the following:
 - Sender e-mail address, this address will be the e-mail address from sending the report.
 - List of recipients (comma separated).

- Send the report each: Select disabled, day (default), week or month. The report contains events and notifications of the selected period.

3. Click **Apply**.

To generate a diagnostic report, click **Send now** or go to the page **HELPDESK** and click **Generate report** to download it directly to your computer. See also *Download of a diagnostic report or a statistics report* on page 9-2.

6.3.9 Dual antenna mode (optional)

The following tasks must be taken care of when setting up a dual-antenna system:

- *Configuring the Master ACU*
- *Configuring the Slave ACU*
- *Blocking zone setup*
- *Line up and commissioning*

At the bottom of the DASHBOARD of the web interface there is a section where you can switch over to the other ACU dashboard. Next to **Status** you can see whether the current ACU is active or not.

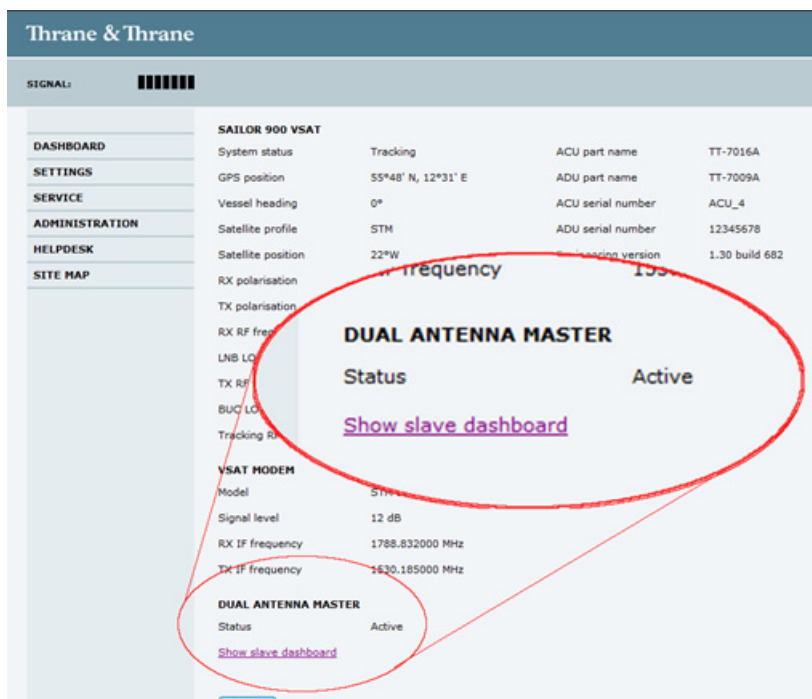


Figure 6-27: Dual-antenna mode, link on DASHBOARD

The dual-antenna system switches between the 2 antennas in the following scenarios:

- When in a programmed blocking zone.
- When the signal is blocked for more than 2 minutes.
- ADU is malfunctioning.

In the statistics report you can get more detailed information on the dual-antenna mode, see also Table 6-11 on page 34.

6.3.9.1 Configuring the Master ACU

The Master ACU is configured exactly the same way as a stand-alone SAILOR 900 VSAT system with satellite profiles and VSAT modem profiles. Do as follows:

1. Go to **SETTINGS > Dual antenna**.
2. Select **Enable** and click **Apply**.

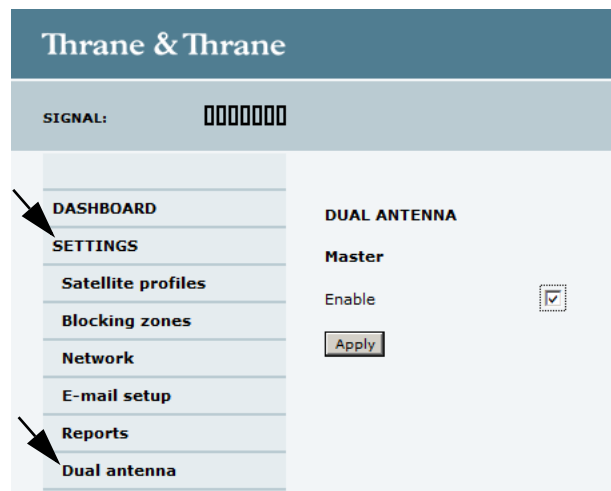


Figure 6-28: Enabling dual-antenna mode in Master ACU

The SAILOR 900 VSAT is now ready to act as Master ACU.

6.3.9.2 Configuring the Slave ACU

The Slave ACU is configured to use the Master ACU as VSAT modem profile. The VSAT modem profile must point to the IP address of the Master ACU, that is the IP address of the LAN port at which the Master/Slave communication cable is connected.

1. Add a specific VSAT modem profile for dual-antenna mode, go to **SETTINGS > Satellite profiles > VSAT modem profiles > New entry**.

The screenshot shows the Thrane & Thrane web interface. On the left is a sidebar menu with the following items: DASHBOARD, SETTINGS, Satellite profiles, VSAT modem profiles, Blocking zones, Network, E-mail setup, Reports, and Dual antenna. The main content area is titled 'ADD VSAT MODEM PROFILE'. It contains the following fields and controls:

- Profile name:** A text input field containing 'Dual Antenna Master'.
- VSAT modem:** A dropdown menu with 'Dual Antenna Master' selected.
- This profile is used on:** A text field displaying '0 satellite profiles'.
- IP address:** A series of four input boxes containing the values '10', '110', '8', and '74' respectively, representing the IP address 10.110.8.74.
- Buttons:** 'Apply' and 'Cancel' buttons at the bottom of the form.

Figure 6-29: Dual-antenna mode, add Slave modem profile

2. Enter the profile name, for example Dual Antenna Master.
3. As VSAT modem select **Dual Antenna Master**.
4. IP address: this is the IP address of the LAN connector at the Master ACU. See *Configuring the LAN network* on page 6-29.
5. Click **Apply**.

- 6. Add a satellite profile that uses the VSAT modem **Dual Antenna Master**, go to **SETTINGS > Satellite profiles > New entry**.

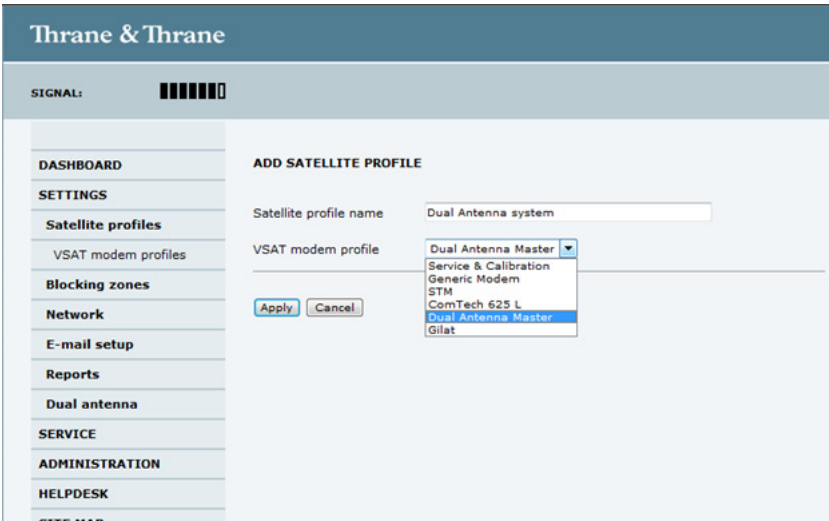


Figure 6-30: Dual-antenna mode, add Slave satellite profile

- 7. Enter the satellite profile name, for example: **Dual Antenna Master**.
- 8. As VSAT modem profile select **Dual Antenna Master**.
- 9. Click **Apply**.
- 10. Go to **SETTINGS > Satellite profiles** and activate the satellite profile **Dual Antenna Master**.

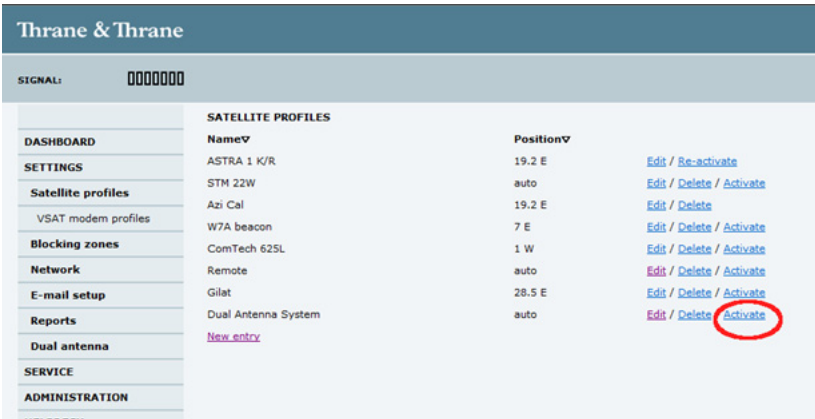


Figure 6-31: Dual-antenna mode, Activate

6.3.9.3 Blocking zone setup

It is recommended to define the following 3 blocking zones in each SAILOR 900 VSAT system:

1. Actual blocking zones on the vessel (No TX)
2. Switching blocking zones (TX allowed).
3. Personnel safety zones (No TX)

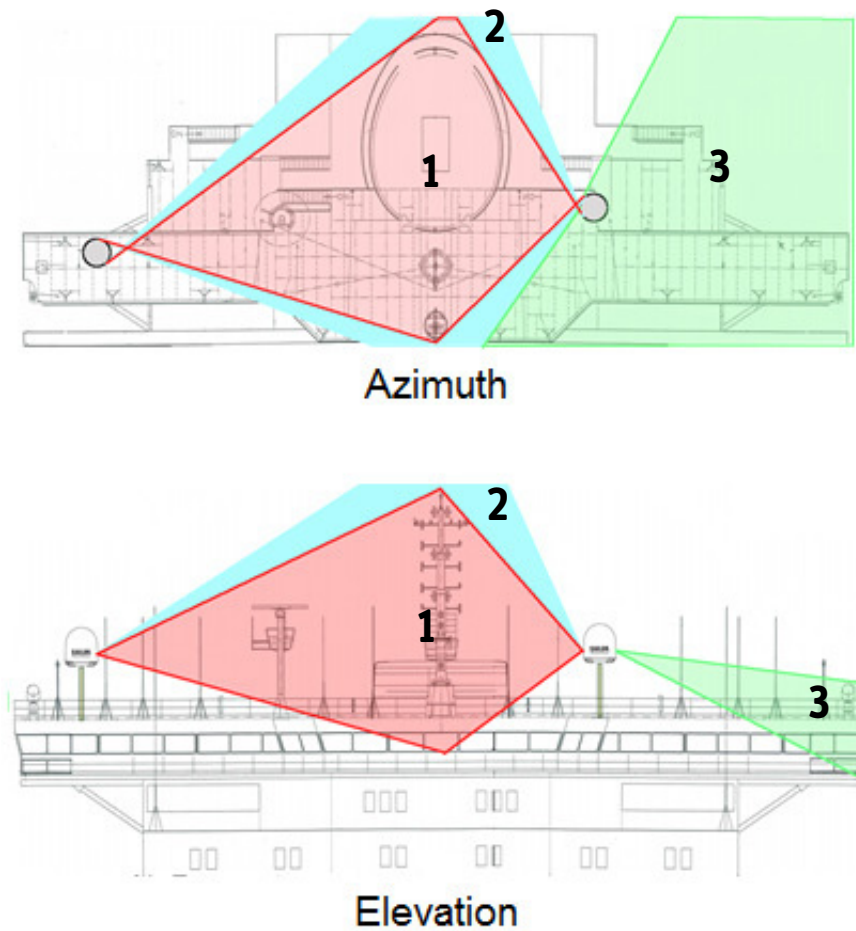


Figure 6-32: Dual-antenna mode, blocking zones – azimuth and elevation

For instructions how to set up blocking zones see *Setting up Blocking zones (RX and TX)* on page 6-27.

6.3.9.4 Line up and commissioning

The SAILOR 900 VSAT antenna systems must be lined up and commissioned one by one. The lineup procedure is done for each antenna as it would have been done for a single antenna system. In order to be able to do the lineup for each antenna you must force the dual system to use one or the other antenna at a time. Do as follows:

1. Enter the web interface of the Master ACU, go to the page **SERVICE > Dual antenna mode**.

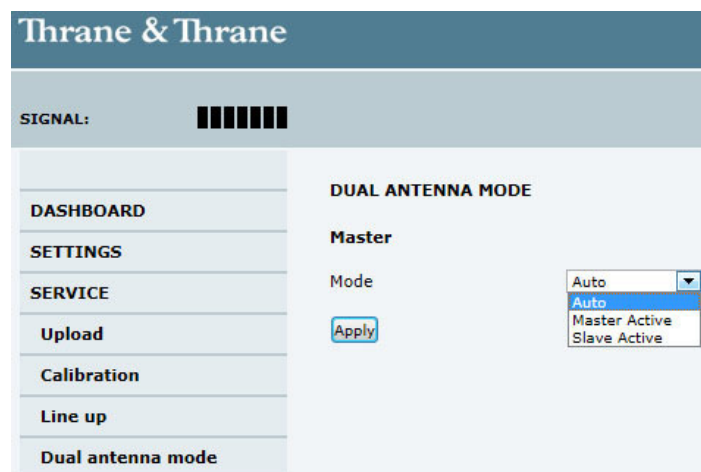


Figure 6-33: Dual-antenna mode, line up

2. Set the mode to either **Master active** or **Slave active** to force the system to use that antenna until it is changed again or the Master system is rebooted. After reboot the dual antenna mode will be set to Auto (default).

6.3.10 Upload

For uploading new software to the SAILOR 900 VSAT see *Software update* on page 9-5.

6.3.11 Administration

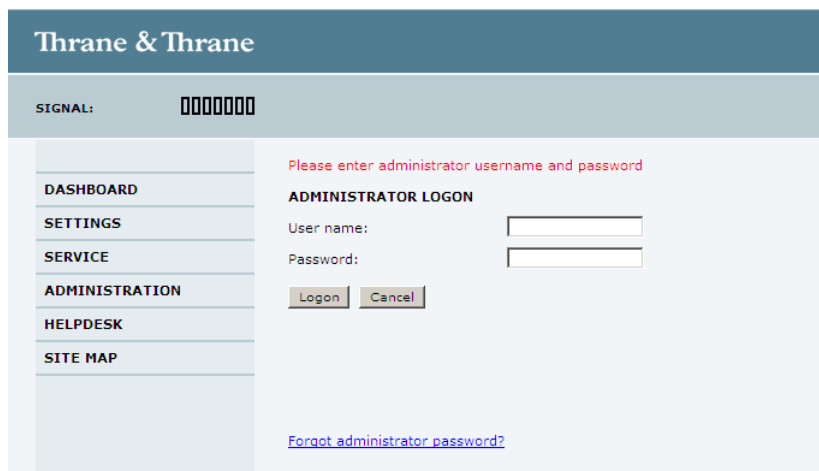
In this section of the web interface you can configure the following administrative settings:

- *Accessing the administration settings (user name, password)*
- *Setting up user permissions*
- *Importing and exporting a system configuration*
- *Resetting to factory default*

6.3.11.1 Accessing the administration settings (user name, password)

The Administration settings require an Administration user name and password. To log on as administrator, do as follows:

1. Select **ADMINISTRATION** from the left navigation pane.
2. Enter the Administration user name and password.
The default user name is **admin** and the default password is **1234**.



The screenshot shows the 'Thrane & Thrane' web interface. At the top, there's a header with the company name. Below it, a 'SIGNAL:' status bar shows a series of empty boxes. On the left, a navigation pane lists: DASHBOARD, SETTINGS, SERVICE, ADMINISTRATION (highlighted), HELPDESK, and SITE MAP. The main content area is titled 'ADMINISTRATOR LOGON' and contains a red message: 'Please enter administrator username and password'. Below this, there are input fields for 'User name:' and 'Password:', followed by 'Logon' and 'Cancel' buttons. A link for 'Forgot administrator password?' is at the bottom.

Figure 6-34: Web interface: Administration

If you have forgotten the administrator password, you can reset the password. For further information, see the next section.

3. Click **Logon**.
The Administration page is now updated to let you change the user name and password or log off Administration.

To change the administrator password, do as follows:

1. After entering the administrator user name and password in the **ADMINISTRATION** page, locate the section **Change administrator logon**.

The screenshot shows the Thrane & Thrane web interface. At the top, there's a header with the company name. Below it, a 'SIGNAL:' status bar shows a full signal. A left sidebar contains a menu with options: DASHBOARD, SETTINGS, SERVICE, ADMINISTRATION (highlighted), User permissions, Export/import config, and Factory default. The main content area has a red warning message: 'Please remember to log off after use'. Below this is the 'Change administrator logon' section, which includes input fields for 'User name' (containing 'admin'), 'New password', and 'Retype new password'. There is a 'Change' button below these fields. Further down is the 'Administrator logoff' section with a 'Logoff' button.

Figure 6-35: Web interface: Administration, change administrator logon and password

2. Type in the new password and retype it on the next line.
3. Click **Change**. At the next logon the new password is required.

To reset the administrator password, do as follows:

1. Contact your service partner for a reset code. Report the serial number of the ACU. You find it in the **Dashboard, ACU serial number**.
2. Click the link **Forgot administrator password?** at the bottom of the **ADMINISTRATOR LOGON** page (see Figure 6-34: *Web interface: Administration*).

The screenshot shows the Thrane & Thrane web interface. The left sidebar menu is the same as in Figure 6-35, with 'ADMINISTRATION' highlighted. The main content area shows the 'RESET ADMINISTRATOR PASSWORD' section. It includes a 'Reset code:' label followed by an input field. Below the input field are two buttons: 'Reset' and 'Cancel'.

Figure 6-36: Web interface: ADMINISTRATION, Reset administrator password

3. Type in the reset code obtained from your service partner and click **Reset**.
4. Type in the user name **Admin**, the default password **1234** and click **Logon**.

6.3.11.2 Logging off administration

If you have not entered anything for 30 minutes under **ADMINISTRATION**, you are logged off automatically. To log off manually, click **Logoff** under administrator logoff in the **ADMINISTRATION** page.

6.3.11.3 Setting up user permissions

You can manage user access to certain functions of the SAILOR 900 VSAT system. You can allow or deny users that are not administrators access to certain functions and make these pages read-only. This is useful if you want to protect the system against unintended changes or tampering of the system.

Important

Study this screen thoroughly and decide which areas of the SAILOR 900 VSAT system you want to give non-administrator users access to.

To set up the user permissions, do as follows:

1. From the left navigation pane, select **ADMINISTRATION > User permissions**.

Thrane & Thrane	
SIGNAL: ■■■■■■	
DASHBOARD	
SETTINGS	
SERVICE	
ADMINISTRATION	
User permissions	
Export/import config	
Factory default	
HELPDESK	
SITE MAP	
ALLOW USERS TO:	
Upload software	<input type="radio"/> Yes <input checked="" type="radio"/> No
Change satellite profiles	<input type="radio"/> Yes <input checked="" type="radio"/> No
Change VSAT modem profiles	<input type="radio"/> Yes <input checked="" type="radio"/> No
Change blocking zones	<input type="radio"/> Yes <input checked="" type="radio"/> No
Change network	<input type="radio"/> Yes <input checked="" type="radio"/> No
Change email settings	<input type="radio"/> Yes <input checked="" type="radio"/> No
Change reports settings	<input type="radio"/> Yes <input checked="" type="radio"/> No
Perform calibration	<input type="radio"/> Yes <input checked="" type="radio"/> No
Modify XIM data	<input type="radio"/> Yes <input checked="" type="radio"/> No
Perform self test	<input type="radio"/> Yes <input checked="" type="radio"/> No
Perform line up	<input type="radio"/> Yes <input checked="" type="radio"/> No
Change dual antenna settings	<input type="radio"/> Yes <input checked="" type="radio"/> No
<input type="button" value="Apply"/> <input type="button" value="Cancel"/>	

Figure 6-37: Web interface: ADMINISTRATION, User permissions

2. For each item under **ALLOW USERS TO:** select
 - **Yes** to allow access

- **No** to block access to the settings. Then the pages are read-only, changes cannot be made by non-administrator users.

Change network: Change IP configuration of the LAN connectors. For further information see *Configuring the LAN network* on page 6-29.

Change email settings: Change e-mail addresses for sending reports. For further information see *E-mail setup* on page 6-32.

Modify XIM data: Only used during service and maintenance. For further information see *Updating VIM/PCM calibration data* on page 9-89.

3. Click **Apply**.

The settings to which access is denied are now greyed out for the non-administrator user.

6.3.11.4 Importing and exporting a system configuration

If you need to reuse a configuration in another SAILOR 900 VSAT system, you can save the current configuration to a file, which can then be loaded into another SAILOR 900 VSAT. You can also use this feature for backup purposes.

The configuration file contains all the settings you have entered during system setup: satellite profiles, modem profiles, LAN setup, blocking zones, etc.

To save a configuration to a file, do as follows:

1. Select **ADMINISTRATION > Export/import config**.
2. Click the button **Export**. Follow the download instructions on the screen. You can use this configuration file for upload into another SAILOR 900 VSAT,

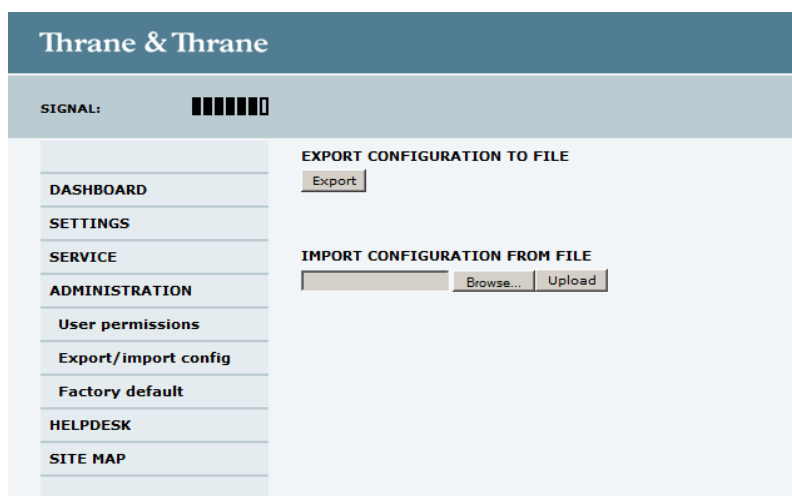


Figure 6-38: Web interface: Administration, Export/import configuration

To load a configuration from a file, do as follows:

1. Select **ADMINISTRATION > Export/import config**.
2. Click the button **Browse** and locate the configuration file (.cfg file) you want to upload. Then click the button **Open**.
3. In the web interface click the button **Upload**.

To clone a system configuration, do as follows:

1. Reset to factory default, see the following section for details.
2. Import a configuration from file, see section above.

6.3.11.5 Resetting to factory default

When resetting SAILOR 900 VSAT to factory default, the following settings are deleted:

- All satellite profiles
- All VSAT modem profiles
- Blocking zones
- Heading settings
- Network setup
- User permissions
- ACU display: brightness setting

To reset to factory default settings, do as follows:

1. From the left navigation pane, select **ADMINISTRATION > Factory default**.



Figure 6-39: Web interface: ADMINISTRATION, Factory default

2. Click **Reset to factory default**.

Note Calibration data for azimuth and cable calibration are not reset during factory default.

6.4 Keypad and menus of the ACU

6.4.1 ACU display and keypad

In the ACU display you can see the current state of the system. You can also see events (warnings, errors and information) and how the system has been configured. Use the keypad to navigate through the menu tree.

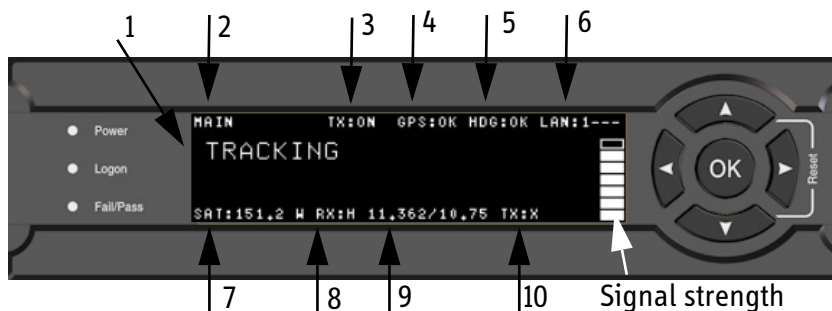


Figure 6-40: Display (example) and keypad of the ACU

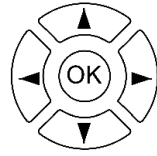
1. Current status of the SAILOR 900 VSAT:
NOT READY (Waiting for input from GNSS, e.g. GPS)
READY (no satellite profile selected)
POINTING ANTENNA (Locating the satellite)
ACQUIRING SIGNAL (Acquiring the satellite signal)
TRACKING (Tracks the current satellite)
FREQUENCY SCAN (Scanning for transponders)
BLOCKING ZONE (Antenna is pointing into a blocking zone)
2. Current menu. See *The menu tree* on page 6-51.
3. TX: Current transmission state, ON or OFF (off when in blocking zone).
4. GPS: GPS signal is received from the GPS module, OK or –.
5. HDG: Ship heading data received from the ship's gyro, OK or –.
6. LAN: LAN connectors used, 1, 2, 3, 4, –. See Figure 4-3: *ACU bulkhead, connector panel overview* on page 4-2.
7. SAT: Satellite position of currently active satellite profile.
8. RX: RX polarisation of currently active satellite profile. H (horizontal), V (vertical), L (left-hand) R (right-hand).
9. RX: Rx RF tracking frequency in GHz and LNB LO Frequency.
10. TX:X TX polarisation of currently active satellite profile. X (Cross polarisation) or Co (Co-pol).

After 1 hour the display is dimmed to lowest intensity. Press any key to light up the display.

6.4.2 Navigating the menus

Use the keypad to navigate the menus.

- Press **OK** or ► to select a menu item.
- Use the arrow keys ▲ and ▼ to go through the menu items or enter a number, digit by digit.
- Use the arrow keys ◀ and ▶ to go through the settings and move from one digit to the next.
- Press **OK** to select a setting.
- Press ◀ again to move one level up. If applicable, confirm to store the new setting by pressing **OK**.



6.4.3 The menu tree

In the menu tree you can see how the system has been configured. You can also enter satellite information directly, if it is necessary to change the satellite information and you cannot use a connected PC and the web interface.

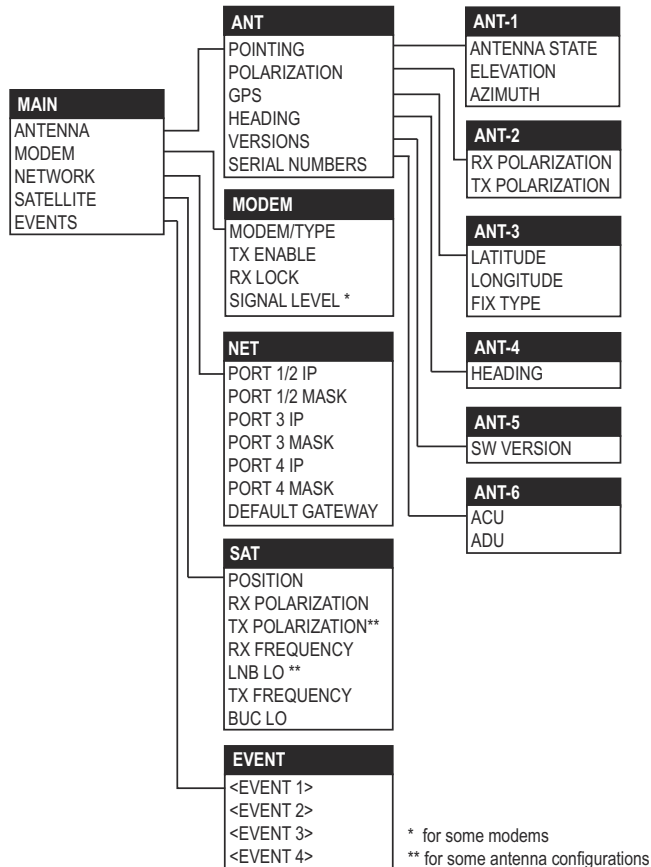


Figure 6-41: Antenna Control Unit, menu tree

6.4.3.1 Top-level menu

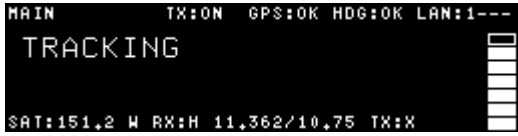
Top-level menu	Description
MAIN	<p>View with current status of the SAILOR 900 VSAT. Example when logged on to the satellite:</p>  <p>This view is displayed after a time out of 10 minutes. Press any key (except left arrow) to enter the menu at MAIN.</p> <p>New events are shown in this display. If an event is displayed, press OK to jump directly to the menu EVENTS for viewing the currently active events.</p>
ANTENNA	Shows the current ADU parameters, position, software version and serial numbers of the ADU and ACU.
MODEM	Selected VMU type and setup, including signal level.
NETWORK	Shows the IP addresses and netmasks of the LAN connectors of the ACU and the management mask.
SATELLITE	Current satellite information. This information is entered using the web interface.
EVENTS	View system events. Active events are shown as: X ACTIVE EVENTS in the MAIN display. Press OK to update the list.

Table 6-12: Top-level menus of the ACU

6.4.3.2 Menu descriptions

ANTENNA menu	Description
POINTING	<p>ANTENNA: See list of states at <i>ACU display and keypad</i> on page 6-49.</p> <p>ELEVATION: Current elevation angle of the antenna</p> <p>AZIMUTH: Current azimuth of the antenna, with reference to North</p>
POLARISATION	<p>RX POLARISATION: HORIZONTAL or VERTICAL, read from connected VSAT modem.</p> <p>TX POLARIZATION: X-POL or Co-POL, read from connected VSAT modem.</p>
GPS	<p>LATITUDE: current latitude, read from GPS module.</p> <p>LONGITUDE: current longitude, read from GPS module.</p> <p>FIX TYPE: 2D or 3D</p>

Table 6-13: ANTENNA menu of the ACU

ANTENNA menu	Description
HEADING	Ship's heading in degrees with reference to North, provided by the ship's gyro.
VERSIONS	Current software version.
SERIAL NUMBERS	ACU: ACU serial number; ADU: Serial number of the antenna

Table 6-13: ANTENNA menu of the ACU (Continued)

MODEM menu	Description
MODEM TYPE	Connected modem type.
TX ENABLE	On or off, information delivered by the connected VSAT modem.
RX LOCK	On or off, information delivered by the connected VSAT modem.
SIGNAL LEVEL	Current input signal level from VSAT modem. iDirect openAMIP modem: (PWR) 0-500, delivered by the connected modem. For values <250 the antenna searches after a new signal. Other modem: Signal level in dB.

Table 6-14: MODEM menu of the ACU

NETWORK menu	Description
PORT 1/2 IP	Current IP address for LAN 1 and LAN 2.
MASK 1/2	Current netmask for LAN 1 and LAN 2.
PORT 3 IP	(LAN 3) Current IP address of the SAILOR 900 VSAT web interface (default: 192.168.0.1).
MASK 3	(LAN 3) Current netmask of the SAILOR 900 VSAT web interface (default: 255.255.255.0).
PORT 4 IP	Current IP address for LAN 4.
MASK 4	Current netmask for LAN 4.
DEFAULT GATEWAY	Current default gateway.

Table 6-15: NETWORK menu of the ACU

SATELLITE menu	Description
POSITION	Position of the current satellite.
RX POLARISATION	HORIZONATL, VERTICAL.

Table 6-16: SATELLITE menu of the ACU

SATELLITE menu	Description
TX POLARIZATION	X-polarisation or Co-polarisation, auto-selected by VSAT modem
RX FREQUENCY	Ku band receiving frequency of the active satellite, auto-selected by VSAT modem.
LNB LO	Auto selected by VSAT modem.
TX FREQUENCY	Transmission frequency, auto-selected by VSAT modem
BUC LO	12.8 GHz, system parameter

Table 6-16: SATELLITE menu of the ACU (Continued)

EVENT menu	Description
<EVENT>	<p>In this menu all active events are listed. Use ▼ and ▲ to go through the active events.</p> <p>Events can be of the type WARNING or ERROR. For a list of events see <i>Event messages – overview</i> on page G-1.</p> <p>If a new event occurs or there is a change in the event list while you are in the EVENTS menu, a * is shown in the upper left corner of the display, next to the menu name. Press OK to update the EVENTS list, the * will be removed.</p> <p>A > means the event text is longer than the display. Press to > to see the remaining text.</p>

Table 6-17: EVENTS menu of the ACU

Example: **EVENT 1/4***: This is the first event out of a list of 4 and there has been a change in the list. EVENT 1/4 will always be shown, the * indicates that there has been a change.

6.4.4 Adjusting brightness of the display

To adjust the brightness do the following:

1. Press and hold **OK** for a short moment until BRIGHTNESS XXX% is displayed (XXX is the current brightness value).
2. Hold OK pressed + press ▲ for lighter or ▼ for darker display.
3. Release OK to leave the brightness menu.

6.4.5 Resetting the system

To reset the system do the following:

1. Press and hold ▲ and ▼ until the ACU display shuts down and the ACU reboots.



Figure 6-42: Reset the system

2. Wait until the system has rebooted and is operational again. The last active satellite profile will be used.

6.5 SNMP support

The SAILOR 900 VSAT supports SNMP v2 requests to retrieve configuration and present settings. SNMP is always enabled on all Ethernet interfaces. The SNMP community string is **public**.

The SAILOR 900 VSAT offers via SNMP most of the data that are available from the DASHBOARD web pages. Detailed documentation about supported OIDs can be found in the SAILOR 900 VSAT MIB file.

The MIB entries are grouped as shown below:

- System configuration
- Navigation coordinates
- Antenna pointing
- Dashboard and profile
- Tracking receiver

Note

All SNMP values are of a nature which does not need to be polled more often than once a minute. Polling SNMP values more frequently will impact the performance of the ACU.

Installation check

Now that you have installed the system, you can test it to verify it is ready for customer delivery. Follow the check lists below to test the system for proper operation.

- *Installation check list: Antenna*
- *Installation check list: ACU, connectors and wiring*
- *Installation check list: Functional test in harbor*

7.1 Installation check list: Antenna

Step	Task	Further information	Done
1.	Check that the antenna is free of obstructions.	See <i>Obstructions (ADU shadowing)</i> on page 3-4.	
2.	Make sure there is sufficient space for access through the service hatch.	See <i>Installing the ADU</i> on page 3-19.	
3.	Make sure to maintain the vertical orientation of the ADU center line.		
4.	Check that the ADU is installed where vibrations are limited to a minimum.		
5.	Check that you programmed the blocking zones correctly.	See <i>Blocking zones – azimuth and elevation</i> on page 3-5 and <i>Setting up Blocking zones (RX and TX)</i> on page 6-27	
6.	Make sure that the safety distance for radiation hazard of 30 metres is kept.	See <i>Safe access to the ADU: Radiation hazard</i> on page 3-6	

Table 7-1: Installation check list: Antenna

Step	Task	Further information	Done
7.	Check that the mounting height of the antenna is in accordance with the ship's min. roll period.	See <i>Ship motion and offset from the ship's motion centre</i> on page 3-7.	
8.	Make sure that the requirements for mast foundation and height, including flatness, gusset plates and distance from welding seams are met.	See <i>ADU mast design: Foundation and height</i> on page 3-8.	
9.	Make sure that the distances to radar, Inmarsat systems, GPS receivers and other transmitters are as required.	See <i>Interference</i> on page 3-13.	
10.	Make sure that the drain tube is open and risk for water intrusion is at a minimum.	See <i>Other precautions</i> on page 3-17.	
11.	Check that the ADU is grounded correctly, using the mounting bolts.	See <i>Grounding the ADU</i> on page 3-23 and <i>Grounding and RF protection</i> on page F-1.	

Table 7-1: Installation check list: Antenna (Continued)

7.2 Installation check list: ACU, connectors and wiring

Step	Task	Verification and further information	Done
1.	Check that the ACU is grounded correctly, using the mounting bolts and washers.	See <i>Grounding the ACU (bulkhead)</i> on page 3-27 or <i>Grounding the 19" rack version of the ACU</i> on page 3-31 and <i>Grounding and RF protection</i> on page F-1.	
2.	Make sure you strain relieved the cables.	See <i>Installation of the ACU (bulkhead)</i> on page 3-26 or <i>Installing the 19" rack version of the ACU</i> on page 3-30.	
3.	Make sure that the VSAT modem is mounted close to the ACU.	See <i>General mounting considerations – VMU</i> on page 3-32.	
4.	Check that the ADU antenna N-connector is properly connected with the 50 Ohm RF cable.	Visual inspection of the cover plate at the bottom of the ADU.	
5.	Check that the ACU antenna N-connector is properly connected with the 50 ohm RF cable.	Visual inspection of the connector panel of the ACU.	
6.	Check that the ACU's Rx Out is connected to the VSAT modem's Rx in using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the VSAT modem.	
7.	Check that the ACU's Tx In is connected to the VSAT modem's Tx out using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the VSAT modem.	

Table 7-2: Installation check list: ACU, connectors and wiring

Step	Task	Verification and further information	Done
8.	<p>Check connection of the VSAT modem:</p> <p>COMTECH only!: Check that the ACU RS-232 port is connected to the Remote Control port and Alarm port of the VMU using the serial cable (specifications in <i>Modem Cable Comtech Serial & RSSI TT7016A</i> on page B-2).</p> <p>iDirect iNFINITI Series/ Evolution only!: Check that the ACU RS-232 port is connected to the Console port of the VMU using the included serial cable.</p> <p>iDirect iNFINITY Series only!: Check that the ACU LAN port 1 is connected to the LAN B of the VMU using the included CAT5 Ethernet cable.</p> <p>iDirect Evolution only!: Check that the ACU LAN port 1 is connected to the LAN of the VMU using the included CAT5 Ethernet cable.</p> <p>STM SatLink 2900: Check that the ACU LAN port 1 is connected to the LAN of the VMU using the included CAT5 Ethernet cable.</p> <p>Gilat SkyEdge II VSAT modem: Check that the ACU RS-232 port is connected to the SERIAL port of the VMU using the included serial cable.</p>	<p>Visual inspection of the connector panel of the ACU and the VSAT modem. See also:</p> <p><i>Connecting a Satlink2900 VSAT modem</i> on page 4-11</p> <p><i>Connecting an iNFINITI® Series Satellite Router</i> on page 4-9</p> <p><i>Connecting an Evolution® Satellite Router</i> on page 4-10</p> <p><i>Connecting a Satlink2900 VSAT modem</i> on page 4-11</p> <p><i>Connecting a Gilat SkyEdge II VSAT modem</i> on page 4-12</p>	
9.	Check that the ADU's NMEA 0183 connector is connected to the NMEA 0183 bus of the vessel using the included multi-connector	Visual inspection of the connector panel of the ACU connector.	
10.	Measure that the power has the correct polarity in the power connector, before connecting it to the ACU power input. (Vin+: left, Vin-: right).	Use a volt meter. See Table 4-1: <i>DC Input plug, outline and pin assignment</i> on page 4-3.	

Table 7-2: Installation check list: ACU, connectors and wiring (Continued)

7.3 Installation check list: Functional test in harbor

Step	Task	Further information	Done
1.	Check that the antenna is tracking the satellite	The logon LED in the ACU display must be steady green and the display shows: TRACKING . In the web interface check: DASHBOARD: System status: Tracking	
2	Check that the VMU is in lock and ready for Tx.	In the web interface check: DASHBOARD > VSAT MODEM > Signal level and RX frequency show values.	
3	Connect a user PC LAN (not the service PC) to the Internet LAN connector, either on the LAN port 2 of the ACU (only X5 VSAT modem) or to the User LAN connector on the VMU.	Check the VSAT modem documentation for details.	
2.	Open a DOS window and type: ping 4.2.2.2.	Check that you get a response.	
3.	Open a web browser and browse to www.google.com.	Check that the web page is downloaded.	
4.	If step 4 is successful and step 5 is not then it seems like the DNS is not configured correctly.	Check with the VSAT modem documentation how the DNS server must be set up, "Obtain DNS server address automatically" or enter specific DNS server addresses.	

Table 7-3: Installation check list: Functional test in harbour

Daily use – Quick guide

QUICK GUIDE

SAILOR 900 VSAT

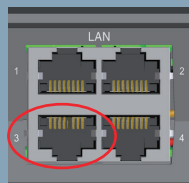
Introduction

The SAILOR 900 VSAT system has been configured during installation with all needed satellite and modem profiles. After startup it uses the last selected satellite profile.

To change to another satellite (or modem profile), or change an antenna parameter, connect a PC to the Antenna Control Unit (ACU) and enter the built-in web interface.

Setup and configuration

1. Switch on the SAILOR 900 VSAT at the power switch of the ACU.
2. Connect a PC to **LAN port 3** (Rack version: Front LAN connector) of the ACU, use a straight Ethernet cable.
3. Enter the address **http://192.168.0.1** (default) in your Internet browser. The built-in web interface opens directly with the **DASHBOARD**.
4. Click **SETTINGS** and activate the new satellite profile.



For detailed information see the **SAILOR 900 VSAT Installation & user manual**.

Thrane & Thrane

SIGNAL: 00000000

DASHBOARD

SETTINGS

SERVICE

ADMINISTRATION

HELPDESK

SITE MAP

DASHBOARD

SETTINGS

Satellite Profiles

VSAT Modem Profiles

Blocking Zones

Network

E-Mail Setup

Reports

Dual Antenna

SERVICE

Upload

Calibration

Line Up

Dual Antenna Mode

XIM Data

ADMINISTRATION

User Permissions

Export/Import Config

Factory Default

HELPDESK

Event List

Self Test

SITE MAP

Thrane & Thrane

Figure 8-1: SAILOR 900 VSAT Quick Guide – web interface and satellite profiles

SAILOR 900 VSAT

Viewing system parameters



Navigation

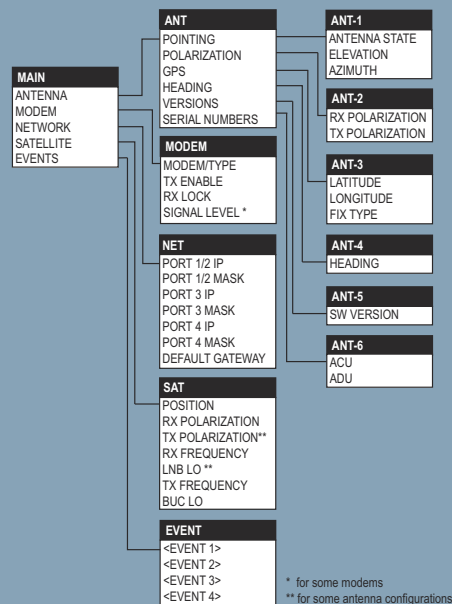
1. Switch on the SAILOR 900 VSAT at the power switch of the ACU.
2. Use the arrow keys on the keypad of the Antenna Control Unit (ACU) to go to a menu.
3. Press **OK**, then the arrow keys on the keypad to select a parameter. The current menu name is shown in the upper left corner of the display.

For changing a parameter in the SAILOR 900 VSAT use the built-in web interface of the ACU. See overleaf for a short introduction to the web interface.

Resetting the ACU

1. Press and hold the arrow up and down keys until the ACU display shuts down and the ACU reboots.
2. Wait until the system has rebooted and is operational again. The last active satellite profile will be selected.

For detailed information see the **SAILOR 900 VSAT Installation & user manual**.



98-133401-D

thrane.com

Thrane & Thrane

Figure 8-2: SAILOR 900 VSAT Quick Guide – Viewing system parameters

Service & maintenance

In this chapter you find the following sections:

- *Getting support: Helpdesk*
- *Software update*
- *Status signalling with LEDs and status messages*
- *Removal and replacement of the ACU*
- *Removal and replacement of ADU modules*
 - *Replacing the GPS module*
 - *Replacing the VSAT Interface Module (VIM)*
 - *Replacing the DC-Motor Driver Module (DDM)*
 - *Replacing the Polarisation Motor Module (PMM)*
 - *Replacing the Pedestal Control Module (PCM)*
 - *Replacing motor and encoder*
 - *Replacing the Drive Belts*
 - *Replacing the Zero Reference Module (ZRM)*
 - *Replacing the Inertial Sensor Module (ISM)*
 - *Replacing the Polarisation Unit*
 - *Replacing the BUC Fan*
 - *Replacing the Block Up Converter (BUC)*
 - *Replacing the Low Noise Block down converter (LNB)*
 - *Replacing the Ortho Mode Transducer (OMT)*
 - *Replacing the rotary joint*
- *Troubleshooting*
- *System block diagram (ADU)*

9.1 Getting support: Helpdesk

If this manual does not provide the remedies to solve your problem, contact your service provider.

9.1.1 Help desk and diagnostic report

9.1.1.1 Support at the Help desk

During the installation you can enter the support contact for this installation.

To access the Help desk, select **HELPDESK** from the left navigation pane.

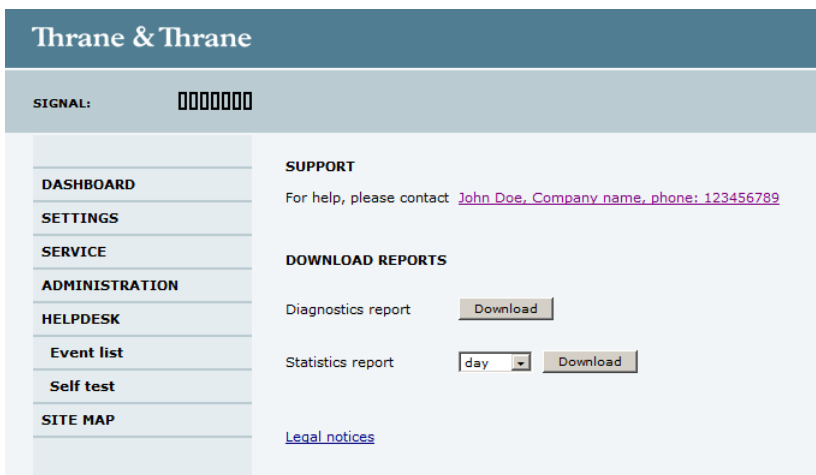


Figure 9-1: Web interface: HELPDESK

Click the link, enter support contact information and click **Apply**. Clicking the link Legal notice provides licence text for the source code of the parts of the SAILOR 900 VSAT software that falls under free and open source software.

If you need help **with ACU or ADU related issues** call your service provider.

9.1.1.2 Download of a diagnostic report or a statistics report


You can download a diagnostic report. This report contains information relevant for the service personnel during troubleshooting. To generate a diagnostics report click **Download**.

You can download a statistics report. This report contains information relevant for the service personnel during troubleshooting.

To generate a statistics report select the period for the statistics from the drop down list and click **Download**.

You can also configure the system to send diagnostic reports at defined time intervals. For further details on this see *Sending a diagnostics report* on page 6-36.

9.1.1.3 Event list

When an event is registered, the web interface shows an event icon  in the icon bar as long as the event is active. The ACU display shows also active events. To view the event list with active events, click the event icon from the icon bar at the top of the web interface, or select **HELPDESK > Event list** from the left navigation pane.



Thrane & Thrane				
SIGNAL:  				
DASHBOARD	ACTIVE EVENTS			
SETTINGS	Time UTC	ID	Unit	Severity Text
SERVICE	13:06:32 10 Sep 2012	09010-0	Terminal	ERROR KDM link/SW version (00000003)
ADMINISTRATION	13:06:27 10 Sep 2012	08108-0	Terminal	ERROR TX Power Detector calibration (00000000)
HELPDESK	NOTIFICATIONS			
Event list	Notification list empty			
Self test				
SITE MAP				

Figure 9-2: Web interface: HELPDESK, Event list

The **Event list** page shows a detailed list of active events and notifications including the time of the first occurrence, ID and severity of the event message, and a short text describing the error.

Active events are cleared from the event list when the error is cleared. They are moved to the section **Notifications** and are displayed there with severity **CLEARED** for 24 hours.

All entries in the section **Notifications** are cleared automatically after 24 hours and after restart of the system.

For a list of all events with description, error code (ID), explanation and remedy see *List of events with explanation and remedy* on page C-1.

9.1.1.4 Self test

You can start a self test of the SAILOR 900 VSAT ADU and ACU.

1. Click **Self test** in the **HELPDESK** page.
2. Click the menu item **Self test**.

Important

Warning! The SAILOR 900 VSAT will reboot to perform the self test. Rebooting the ACU will terminate all existing connections.

9.1.1.5 Reset to factory defaults

You can reset the SAILOR 900 VSAT ADU and ACU to factory defaults. See *Resetting to factory default* on page 6-48.

Important

Warning! Reset to factory default will delete all settings, including satellite and VSAT modem profiles, blocking zones, network setup, user permissions and ACU display brightness settings.

9.2 Software update

9.2.1 Hardware and software requirements

The following items are required before the software can be updated:

- One computer with a standard Ethernet port available.
- A standard Internet browser.
- 1024×768 pixels or higher display resolution. The program is best viewed using small fonts.
- One straight LAN cable.
- The file containing the new software.

9.2.2 Software update (ADU and ACU)

Note Software update should only be done by qualified service personnel.

1. Power up the SAILOR 900 VSAT system, i.e. switch on the ACU. Wait until the SAILOR logo has disappeared from the ACU display.
2. Connect a PC to LAN interface 3 (Service port, standard Ethernet) of the ACU. For the rack version, connect the LAN cable to the front LAN connector of the ACU.

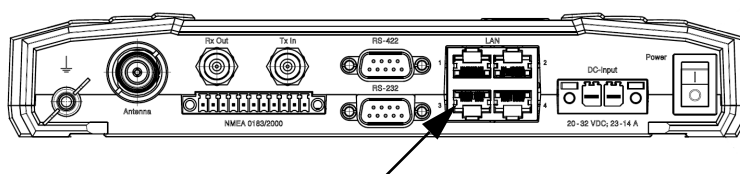


Figure 9-3: LAN connector used for configuring the SAILOR 900 VSAT

3. Open your Internet browser and enter the IP address of the ACU. The IP address is **http://192.168.0.1** (default). For further details on network setup see *Configuring the LAN network* on page 6-29.
4. The web interface opens directly with the **DASHBOARD** page.
5. Click **SERVICE** from the left navigation pane. The **Upload** page is displayed.
6. Click **Browse...** and locate the new software file.
7. Click **Upload**.

Note that the upload procedure takes a couple of minutes. When done, the ACU automatically restarts with the new software version.

Important

Do not browse away from the upload page. This will terminate the upload process. Wait for the browser to reload automatically.

The start-up procedure after a software upload takes longer than the usual start-up time, as the software in the ADU must also be updated. The ACU display shows: **ADU SW UPLOAD**.

9.2.2.1 If software upload fails - how to recover


To recover from a failed software upload, turn off the ACU and turn it on again. Then repeat the upload procedure as described in *Software update* on page 9-5.

9.2.3 Verifying the software update

9.2.3.1 Testing procedure

1. The software version can be viewed in the **DASHBOARD** window of the web interface.
2. After completing the software update procedure, the ACU will perform a POST (Power On Self Test).
3. When the POST has finished, the green Pass/Fail LED on the front of the ACU must become steadily green. Verify that the Pass/Fail LED is not red nor flashing orange once every 2 seconds. Wait until the Pass/Fail LED is green.
4. Verify that the software update has been completed successfully. You find the software version number in the **DASHBOARD** window of the web interface.

Thrane & Thrane

SIGNAL: 

DASHBOARD	SAILOR 900 VSAT			
SETTINGS	System status	Tracking	ACU part name	TT-7016A
SERVICE	GPS position	55°48' N, 12°31' E	ADU part name	TT-7009A
ADMINISTRATION	Vessel heading	5°	ACU serial number	ACU_4
HELPEDESK	Satellite profile	ROSS (auto)	ADU serial number	80539020
SITE MAP	Satellite position	40°E	Software version	1.30
	RX polarisation	Horizontal	POINTING	
	TX polarisation	X-pol	Azimuth relative	143.6°
	RX RF frequency	11.120847GHz	Elevation relative	20.4°
	LNB LO frequency	9.750000GHz	Polarisation skew	-17.6°
	TX RF frequency	14.417282GHz		
	BUC LO frequency	12.800000GHz		
	Tracking RF frequency	11.120847GHz		
	VSAT MODEM			
	Model	ComTech CDM 570L and ROSS		
	Signal level	14dB		
	RX IF frequency	1370.847000MHz		
	TX IF frequency	1617.282000MHz		
	<input type="button" value="Refresh"/>			

Figure 9-4: Verifying software update

9.3 Status signalling with LEDs and status messages

9.3.1 Overview

9.3.1.1 Built-In Test Equipment

The ADU and the ACU have a Built-In Test Equipment (BITE) function in order to make fault diagnostics easy during service and installation. The BITE test is performed during:

- Power On Self Test (POST), which is automatically performed each time the system is powered on.
- Person Activated Self Test (PAST), which is initiated by starting a self test in the web interface **HELPDESK > Self test**.

For details on error messages after a POST or a self test see *Event list* on page 9-3.

9.3.1.2 Means of signalling

The SAILOR 900 VSAT provides various methods for signalling the system status. **LEDs** on the front panel of the ACU are used to signal:

- Power on/off
- Logon
- Fail/Pass

The built-in web interface of the ACU shows any events (BITE error codes) with a short message describing each error. This is also displayed in the ACU.

In an error situation, one of the following system status messages may be shown:

- ACU POST error
- ADU POST error
- SAFE MODE (plus information about the specific error, see *System messages* on page G-1).

During service and maintenance, one of the following system status messages may be shown:

- Service switch
- Azimuth calibration
- TX cable calibration
- XIM data error

9.3.2 LEDs of the ADU modules

Each ADU module has a Power and a Service LED.

LED	Behavior	Description
Power	Steady green	Power supply OK
	Off	No power
Service	Steady green	Module ok, application running.
	Flashing green	Waiting for upload
	Flashing red/green	Uploading application
	Steady red	Module error or loading error

Table 9-1: LEDs of the ADU modules

For a list of modules see *Removal and replacement of ADU modules* on page 9-12.

9.3.3 LEDs in the ACU

The ACU has 3 LEDs: Power, Logon and Fail/Pass LED.



LEDs

Figure 9-5: LEDs on the ACU



LEDs

Figure 9-6: LEDs on the ACU, 19" rack version

LED	Behavior	Description
Power	Steady green	Power supply OK
	Steady red	Power supply failure
	Off	No power
Logon	Flashing green	Current status is displayed: <ul style="list-style-type: none"> • Searching satellite • Identifying satellite • Carrier lock & TX enabled from modem
	Steady green	Satellite link established
	Off	No satellite link acquired
Fail/Pass LED	Steady red	A fault which prevents operation is present in the system (ACU, ADU, MODEM).
	Flashing green	A Power On Self Test (POST) or Person Activated Self Test (PAST) in progress. The current status is displayed.
	Flashing red	Active BITE failure or warning. The event is shown in the ACU display.
	Steady green	No faults.

Table 9-2: LEDs on the ACU

9.4 Removal and replacement of the ACU

There are no parts in the ACU that you can remove or replace. Contact your Thrane & Thrane service partner for further repair or replacement.



Figure 9-7: Removal and replacement of the ACU bulkhead

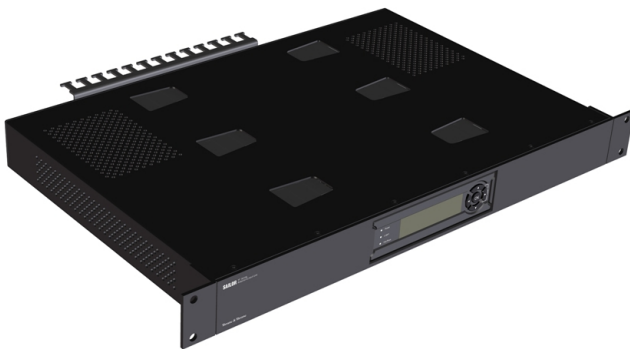


Figure 9-8: Removal and replacement of the ACU 19" rack

9.5 Removal and replacement of ADU modules

9.5.1 Overview

All replacement of modules must be carried out by a Thrane & Thrane A/S service partner. The figure below shows the modules and their position. Some modules are equipped with LEDs for status information and troubleshooting.

For instructions on how to open and remove the service hatch see *Opening and removing the service hatch* on page 3-22.

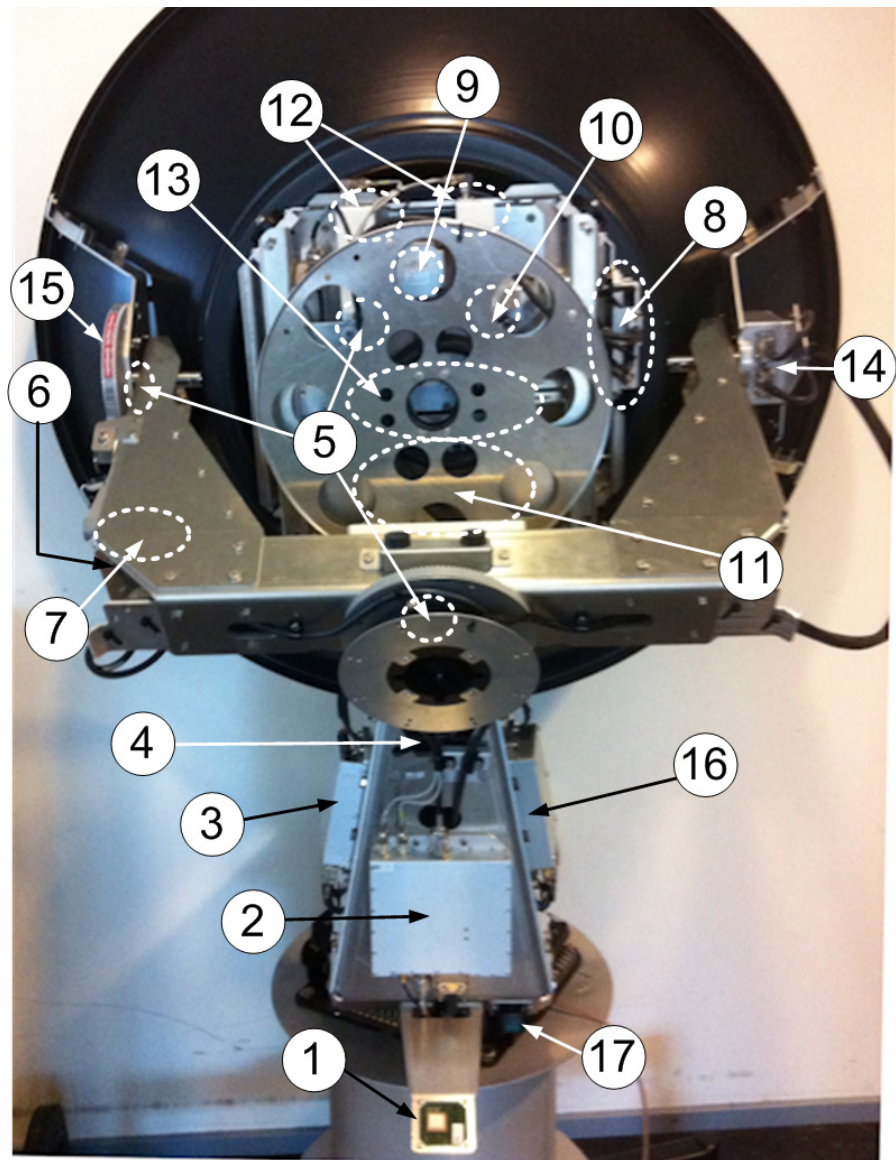


Figure 9-9: ADU modules and motor stop switch

1. GPS module.

This module is positioned near the service switch at the bottom of the pedestal. It converts the GPS satellite signals into current position data.

2. VSAT Interface Module (VIM).

The purpose of the VIM is to interface between the ADU coaxial cable carrying several signals (DC, modem, RX IF, L-band TX) and the cable to the LNB/BUC, and the PCM. The VIM takes the received L-band transponder signal from the LNB and converts it to a lower frequency and allows the whole L-band transmitter band to be routed to the BUC.

For tracking purpose the VIM has a DVB-S/S2 demodulator for tracking at the TV-satellites. For narrow band signal or non-DVB tracking the VIM also has a power detector as signal strength indicator. The VIM also has PSU for the external LNB and BUC.

The VIM consists of the following blocks:

- Power supply block for on board circuits, supply to PCM board and regulated external output to LNB (with band switching) and BUC.
- DVB-S/S2 tracking receiver with tuner and demodulator including wide band signal detector and narrow band channel detector.
- LNB Receive signal down converter with mixer and PLL.
- Cable attenuator section to control the output power variation to the BUC.
- FPGA section to control the functions of the VIM including DVB transport stream decoding.
- Filters for splitting and combining the DC, modem, received down converted IF from the LNB and the transmit signal to the BUC.

3. DC-Motor Driver Module for cross elevation (DDM).

The DDM shall - based on inputs from the PCM - control the torque delivered by the brush-less DC-motors (BLDCM), used to control the position of the parabolic reflector.

The DDM board is:

- Communication slave of the ADU Serial-Bus (S-Bus) connecting the DC-motor Driver Modules (DDM), the Polarization Motor Module (PMM), the Inertial Sensor Module (ISM) and the Pedestal Control Module (PCM).
- Connection to the BLDCM, and delivering the required phase current to the motor.
- Decoding the HALL-sensor input from the Zero Reference Module (ZRM).

- Decoding the input from the Optical Rotary Encoder (ORE).
 - Incorporating a break function when not powered.
4. Cross elevation motor and encoder.
 5. Zero Reference Module (x4, 3 in the previous figure, 1 in the next figure) (ZRM) (not visible on photo).

In order to be able to find the predefined zero point of the antenna direction, HALL sensors and corresponding magnets mount in the gearwheels. Due to the magnetic hysteresis behaviour of the hall sensor, the software will have to make the magnets pass the hall sensor in both directions, and when use the mean value as the zero point.

The ZRM features two LEDs; one for indication of power supply, and one for indication of zero point.
 6. DC-Motor Driver Module for elevation (on the bottom side) (DDM).

As in item 3 above.
 7. Elevation motor and encoder (not visible on photo).
 8. Polarisation Motor Module (PMM).

The PMM shall - based on inputs from the PCM - control the angle position of the Polarization Mechanism Assembly (PMA).
The PMM board is:

 - Communication slave of the ADU Bus also connecting the DC-motor Driver Modules (DDM), the Inertial Sensor Module (ISM) and the Pedestal Control Module (PCM).
 - Driving a stepper motor, with micro stepping capability.
 - Motor Filter which filters electrical noise and minimizes acoustic noise.
 - Detection of temperature and power level from the Ortho Mode Transducer (OMT).
 - Decoding the HALL-sensor input from the Zero Reference Module (ZRM).
 - Decoding the input from the Optical Rotation Encoder (ORE).
 9. Polarisation motor.
 10. Polarisation encoder (not visible on photo).
 11. Block Up Converter (BUC). (behind cable screen, not visible on photo)

The BUC converts the L-band (950 to 1700 MHz) Intermediate Frequency (IF) up to Ku-band (13.75-14.50 GHz (extended)) radio signal, and amplifies it to transmit power level. It receives transmit signal and power from VIM.

12. Low Noise Block down converter (x2) (LNB).

The LNB receives the Ku-band (10.70-12.75 GHz) radio signal, amplifies it and converts it down to a L-band (950 or 2150 MHz) Intermediate Frequency (IF). The conversion is controlled by 2 Local Oscillator (LO) frequencies and the LO frequency is locked to an external reference signal.

The Ku-band interface is WR75 waveguide and the IF interface is a 75 Ohm F-connector. DC power and 10 MHz external reference signal are also supplied over the IF cable. The L-band IF output is routed to the VSAT Interface Module (VIM) located on the ADU's azimuth pedestal.

13. Ortho Mode Transducer (OMT). (behind cable screen, not visible on photo)

The OMT provides a low-loss waveguide interface between the dual polarised ADU feed-horn and the BUC/LNB. The main purpose of the OMT is to separate transmitter and receiver signals and to provide sufficient isolation between BUC and LNB. The OMT uses the orthogonality of the signals to split and provide isolation. The OMT also detects the BUC output power and temperature.

14. Inertial Sensor Module (ISM).

The ISM shall – based on request from the PCM – provide information about movement of the parabolic reflector, in the form of samples from gyro- and acceleration-sensors.

The ISM board is:

- Communication as slave of the ADU Bus connecting the Inertial Sensor Module (ISM), the DC-motor Driver Modules (DDM), the Polarization Motor Module (PMM), and the Pedestal Control Module (PCM).
- Collection of contemporary sample-data sets from all sensors and provide those to the PCM on request. A set of samples should be collected within less than 100 micro seconds.
- High stability and accuracy 3 axis accelerometer and angular rate sensor.
- Prepared for wide range 3 axis accelerometer.
- Calibration of sensor offset, gain, and misalignment over temperature (stored in non-volatile memory).
- Secure fixing to the parabolic reflector.
- Diagnosis of board supplies, sensor inputs, etc.

15. Elevation locking pin to lock the antenna dish in a fixed position (for safety during service) (not visible on photo).

16. Pedestal Control Module (PCM).

The PCM will - based on several inputs - control the position of the parabolic reflector and the polarization angle of the polarisation mechanism assembly via 3 brush less DC-motors and a stepper motor.

The PCM board is:

- Modem communication with a below deck Antenna Control Unit via a VSAT interface module (VIM).
- Control of the VIM module devices via a parallel interface connector.
- Communication master of the ADU Bus connecting to the DC-motor Driver Modules (DDM), the Polarization Motor Module (PMM), and the Inertial Sensor Module (ISM).
- Communication with the GPS module.
- Provide power to the modules connected via the ADU bus (motor drivers supplies and bus interface circuits' supplies) with over-current protection (hot swap) via the bus cable.
- Modules are by means of shielded DB9 cables connected in a chain in the following order: PCM – DDM (azimuth) – DDM (X-elevation) – DDM (elevation) – ISM – PMM. PMM module contains signal terminations.

17. Service switch.

In switch-off position the DC Motor Driver modules (DDM), the Polarisation Motor Module (PMM) and the BUC are turned off for safe conditions during service and repair. The switch must be in on position for normal ADU operation. The switch only controls movements and prevents any transmission. In Off position the DDMs, PMM and BUC are turned off for safety during service and repair of the ADU.



Figure 9-10: Service switch

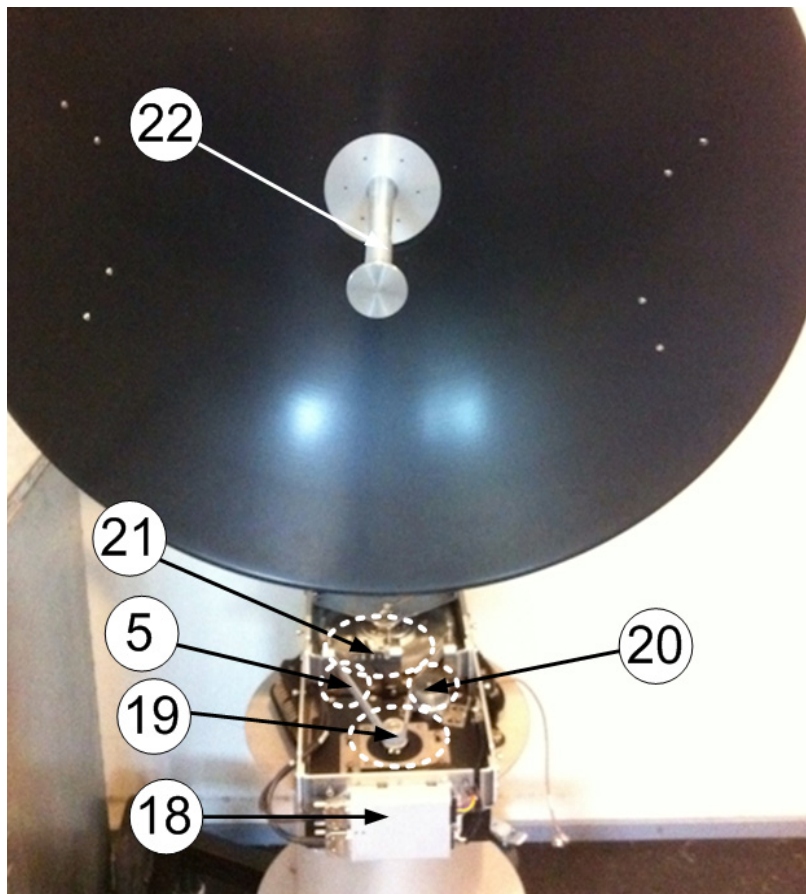


Figure 9-11: Above Deck Unit modules (continued)

18. DC-Motor Driver Module for Azimuth (DDM).

As in item 3 above.

19. Azimuth motor.

20. Azimuth encoder.

21. Rotary joint.

The cable signals for the ADU (DC power, internal modem communication, TX IF, RX and L-band TX) to and from the ACU have to be ported from the stationary platform to the azimuth rotating part of the ADU. This is done via the rotary joint.

22. Feed horn.

The feeder horn carries the mirror centred of the dish and in the correct distance. Thereby the signal from the satellite is reflected by the dish and picked up by the mirror. Then it is transported through the horn to the OMT.

Before contacting your service partner check the LEDs on all modules (VIM, DDMs, PCM, PMM and ISM). See *LEDs of the ADU modules* on page 9-9 and *LEDs in the ACU* on page 9-10.

9.5.1.1 Tools needed

Have the following tools ready at hand when starting to replace modules:

- 4x150 mm Allen key (located inside the service door of the ADU)
- Torx 20 screw driver
- Flat head screw driver
- 8 mm open-end spanner
- 11 mm open-end spanner
- 18 mm open-end spanner
- Acoustic frequency meter

9.5.2 Replacing the GPS module

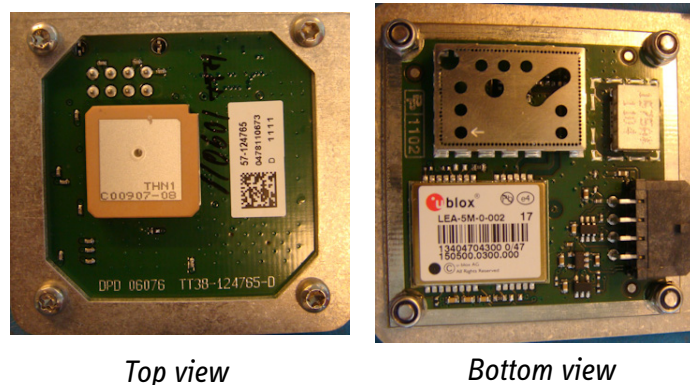


Figure 9-12: GPS module

The GPS Module is equipped with a receiver antenna (on top side) receiving the signals transmitted from the GPS satellites (low orbit), typical 10-12 are visible above the horizon. On the opposite side (bottom side) of the GPS Module the engine is located. It converts the GPS satellite signals into current position data (latitude, longitude and level). A minimum of 4 GPS satellites should be seen by the GPS Module to produce a valid position.

The GPS module is identical to the ones used in Thrane & Thrane SAILOR FleetBroadband products.

To replace the GPS module, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

Tools needed:

- 4x150 mm Allen key (located inside the service hatch of the ADU).

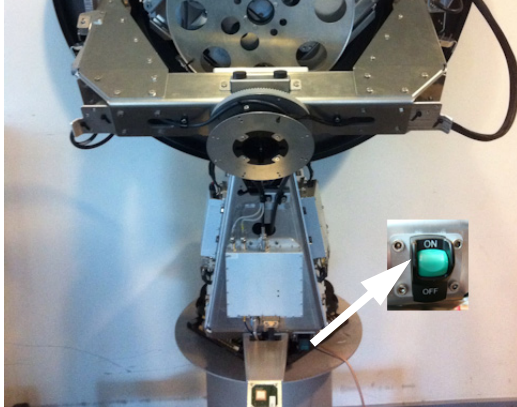


Figure 9-13: Switch off the power to the antenna

3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.

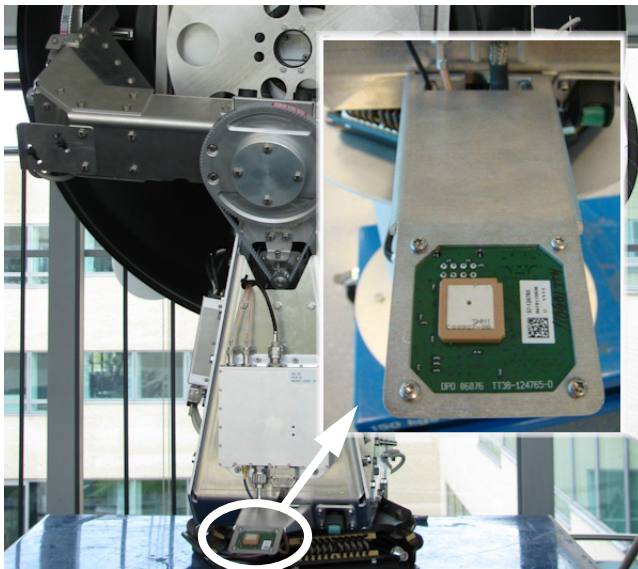


Figure 9-14: GPS module facing the service hatch

4. Disconnect the connector located on the bottom side of the GPS PCB.



Figure 9-15: Connector for GPS PCB

5. Loosen the 4x4 mm Allen screws.



Figure 9-16: Screws on GPS module

6. Lift the complete GPS module free, in the key holes, from the pedestal.

To insert a new GPS module follow the instructions above in reverse order.

9.5.3 Replacing the VSAT Interface Module (VIM)

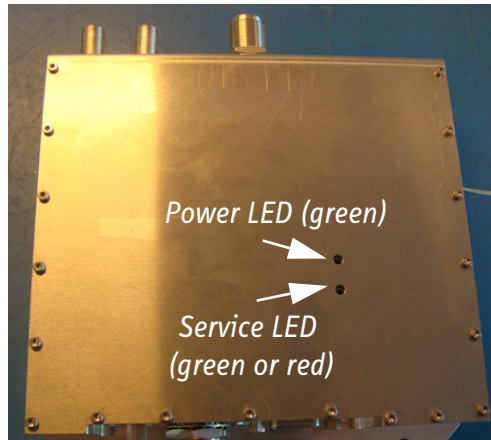


Figure 9-17: VSAT Interface Module (VIM)

The VIM is the interface between the antenna cable signals (power, internal modem communication, RX IF and L-band TX) and to the cable to the LNB /BUC and PCM. The VIM also provides power to the LNB and BUC and all other modules in the ADU.

The VIM has two LEDs for status and troubleshooting:

- Power LED: green or Off
- Service LED: green or red

To replace the VIM, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

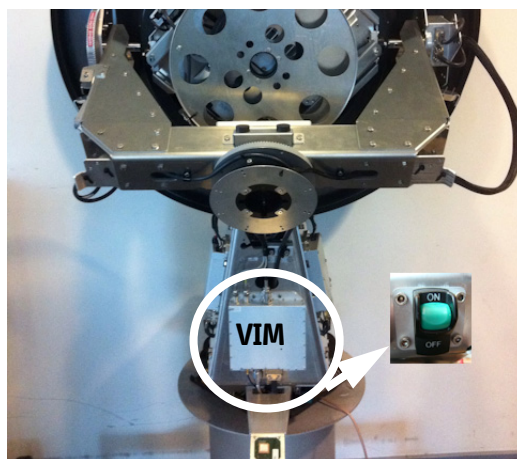


Figure 9-18: Location of the VIM

3. Rotate the antenna pedestal so that the arm of the GPS module faces the service hatch.

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- 8 mm open-end spanner
- 11 mm open-end spanner
- 18 mm open-end spanner
- Flat head screw driver

4. Disconnect the 2 F-connectors at the top of the VIM.

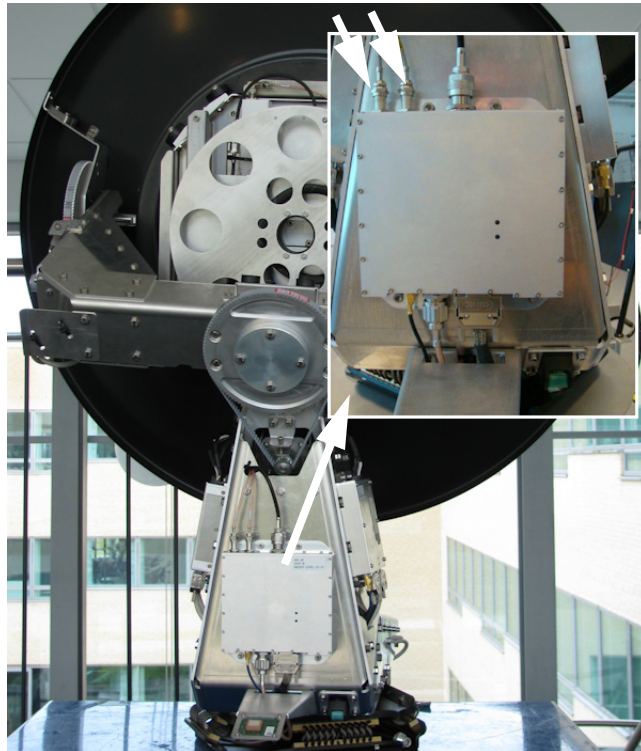


Figure 9-19: Replacing the VIM – remove 2 F-connectors

5. Disconnect the 2 N-connectors, one at the top and one at the bottom of the VIM, the 2 F-connectors (note the connections) on top of the VIM, the SUB-D-connector, then the small cable (SMA connector) at the bottom of the VIM.

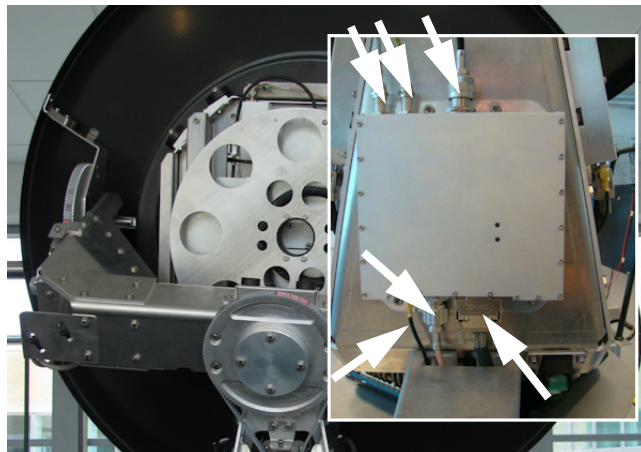


Figure 9-20: Replacing the VIM – remove 2 N, 2 F, 1 SMA and 1 SUB-D connectors

6. Remove the 4x4 mm Allen screws and remove the VIM.

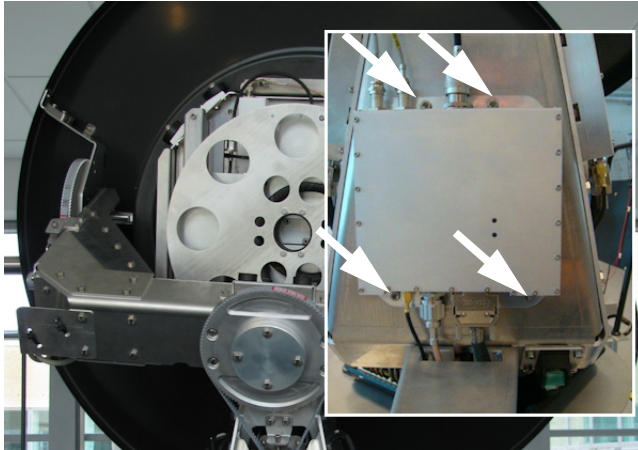


Figure 9-21: Replacing the VIM – remove 4 Allen screws

To insert a new VIM follow the instructions above in reverse order.

Important

After installing a new VIM you must update the calibration data. For instructions see *Updating VIM/PCM calibration data* on page 9-89.

9.5.4 Replacing the DC-Motor Driver Module (DDM)

The ADU is equipped with three (3) DDMs for the axes:

- Cross Elevation DDM
- Elevation DDM
- Azimuth DDM

By the input from the PCM the DDM controls the power delivered to the DC-motors to control the orientation of the ADU.

The DDM has two LEDs for status and troubleshooting:

- Power LED: green or Off
- Service LED: green or red

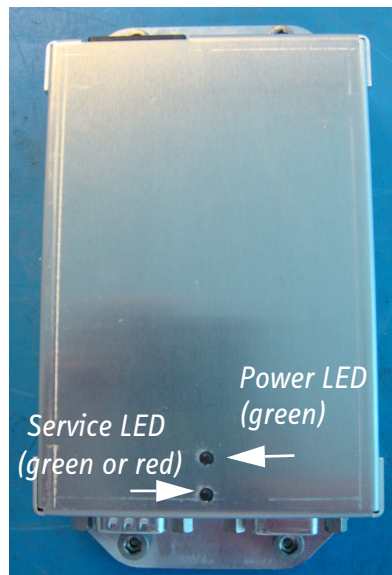


Figure 9-22: DC-Motor Driver Module (DDM) for Cross Elevation

For step-by-step instructions see:

- *Removing the Azimuth DDM* on page 9-27
- *Inserting a new Azimuth DDM* on page 9-28
- *Removing the Azimuth DDM* on page 9-27
- *Inserting a new Azimuth DDM* on page 9-28
- *Removing the Azimuth DDM* on page 9-27
- *Inserting a new Azimuth DDM* on page 9-28

9.5.4.1 Removing the Cross Elevation DDM

To replace the Cross Elevation DDM, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

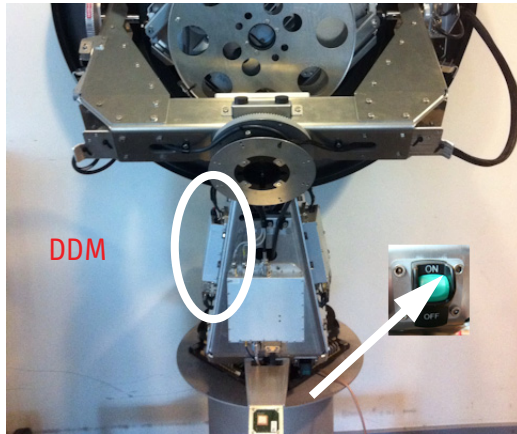


Figure 9-23: Location of the Cross Elevation DDM

3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.
4. Disconnect the 3 connectors at the top of the Cross Elevation DDM, then the 2 SUB-D connectors at the bottom of the DDM.

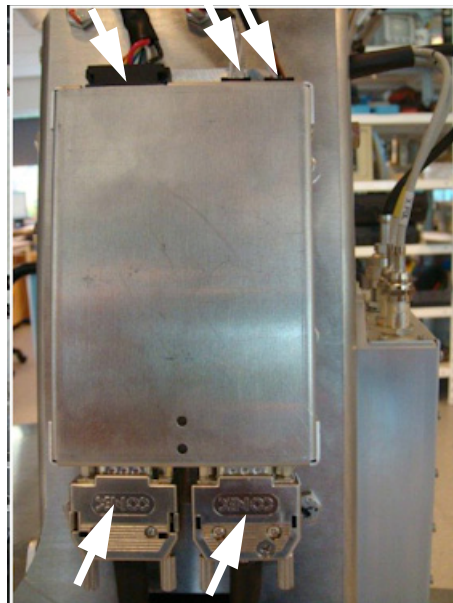


Figure 9-24: Replacing the DDM – remove connectors

5. Remove the 4x4 mm Allen screws (visible when the connectors are removed) and remove the Cross Elevation DDM.

9.5.4.2 Inserting a new Cross Elevation DDM

To insert a new DDM follow the instructions above in reverse order.

9.5.4.3 Removing the Elevation DDM

To replace the Elevation DDM, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

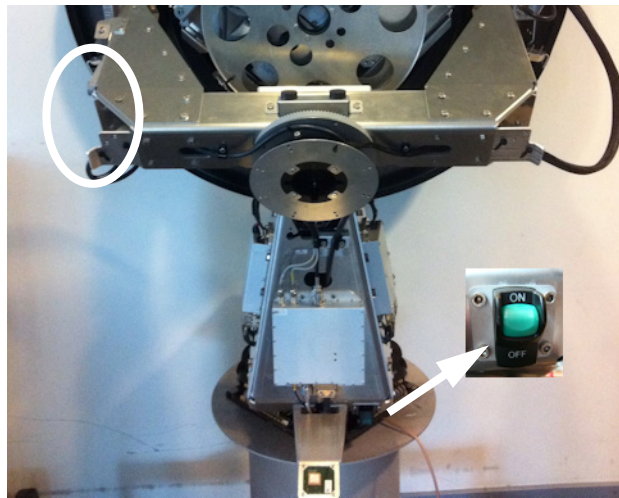


Figure 9-25: Location of the Elevation DDM

3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.
4. Disconnect the 3 connectors at the front of the Elevation DDM, then the 2 SUB-D connectors at the rear of the Elevation DDM.

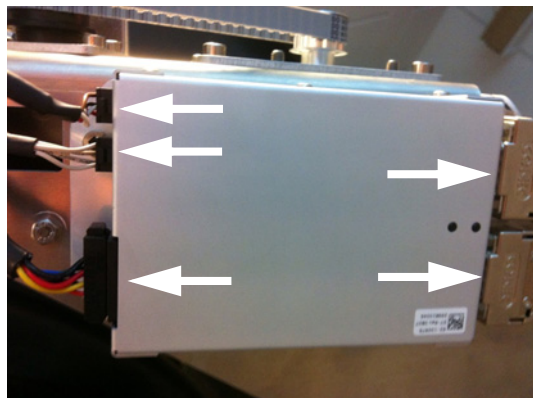


Figure 9-26: Elevation DDM, connectors

5. Remove the 4x4 mm Allen screws (visible when the connectors are removed) and remove the Elevation DDM.

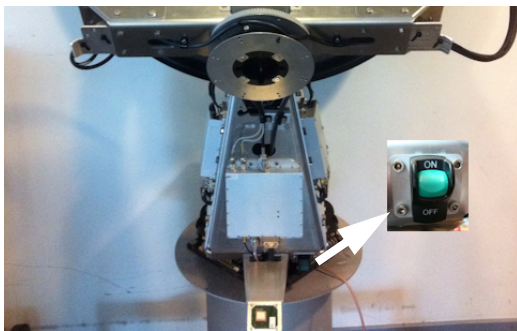
9.5.4.4 Inserting a new Elevation DDM

To insert a new Elevation DDM follow the instructions above in reverse order.

9.5.4.5 Removing the Azimuth DDM

To replace the Azimuth DDM, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

**Tools needed:**

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.
4. Locate the Azimuth DDM at the front of the antenna.



Figure 9-27: location of the Azimuth DDM

5. Disconnect the 3 connectors at the right of the Azimuth DDM, then the 2 SUB-D connectors at the left of the Azimuth DDM.

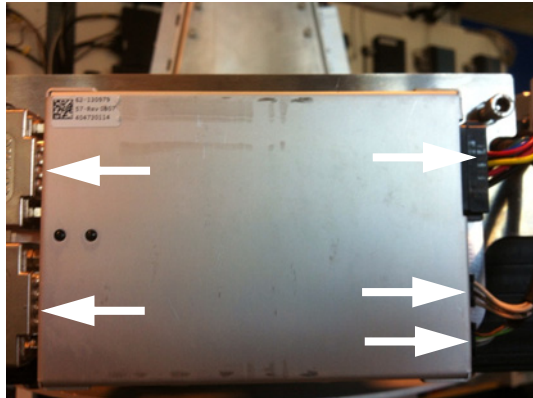


Figure 9-28: Azimuth DDM, connectors

6. Remove the 4x4 mm Allen screws (visible when the connectors are removed) and remove the Azimuth DDM.

9.5.4.6 Inserting a new Azimuth DDM

To insert a new Azimuth DDM follow the instructions above in reverse order.

9.5.5 Replacing the Polarisation Motor Module (PMM)

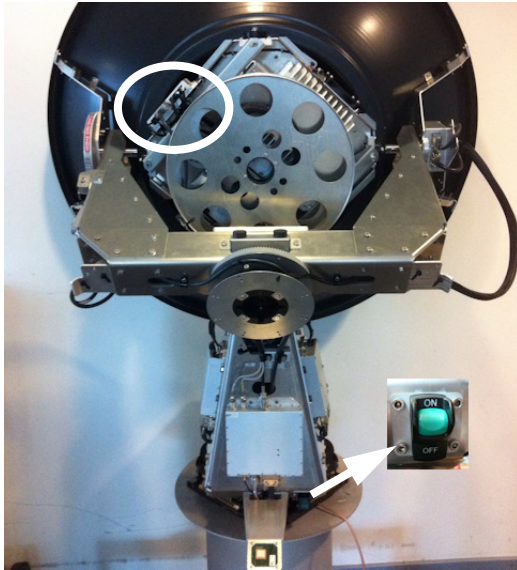
9.5.5.1 Removing the Polarisation Motor Module (PMM)

To remove the Polarisation Motor Module, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.
4. Rotate the Antenna Dish to top position.
5. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.
6. Rotate the Polarisation Unit so that the Polarisation Motor Module (PMM) can be reached.
7. Disconnect the 6 connectors from the PMM.



Figure 9-29: Polarisation Motor Module, remove connectors

8. Remove the 4x4 mm Allen screws.

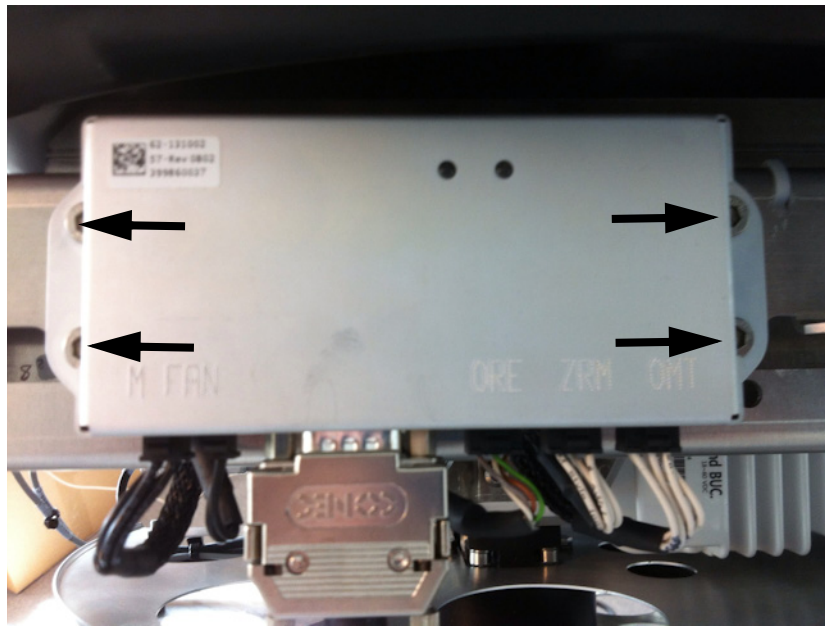


Figure 9-30: Polarisation Motor Module, remove screws

9. Remove the PMM.

9.5.5.2 Inserting a new Polarization Motor Module.

To insert a new Polarization Motor Module (PMM) follow the instructions above in reverse order – **while observing the following guidelines:**

1. Connect the **6-pin connector with the colored wires** (Polarization Encoder) to the plug marked **ORE** on the PMM.
2. Connect the **6-pin connector with white wires, only 4 wires available**, (Zero Reference Module) to the plug marked **ZRM** on the PMM.

3. Connect the **6-pin connector with white wires, all 6 wires available**, (Ortho Mode Transducer) to the plug marked **OMT** on the PMM.



Figure 9-31: Polarisation Motor Module, inserting

9.5.6 Replacing the Pedestal Control Module (PCM)

The PCM controls the antenna dish and the Polarization Mechanism Assembly with the three DC motors and a step motor. Communication between the PCM and ACU is done via the VIM. The VIM is also controlled by the PCM via a parallel interface cable.

The PCM is the communication master of the ADU serial-bus connecting the DDM, PMM and ISM. Communication to the GPS Module and power to all modules is via S-bus.

The PCM has two LEDs for status and troubleshooting:

- Power LED: green or Off
- Service LED: green or red

To replace the PCM, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver
- 8 mm open-end spanner

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

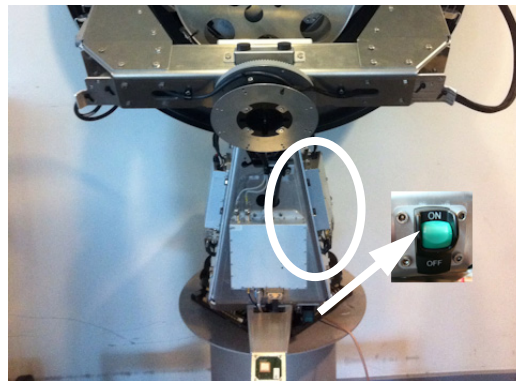


Figure 9-32: Location of the PCM

3. Rotate the antenna pedestal so that the Pedestal Control Module (PCM) faces the service hatch.

4. Disconnect the 2 connectors at the top, then the 2 SUB-D connectors at the bottom, then the SMA connector at the bottom (left) of the PCM.

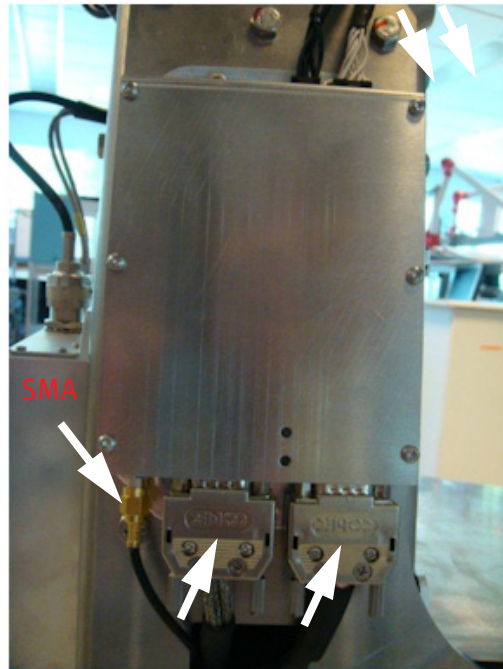


Figure 9-33: Removing the PCM – connectors

5. Remove the 4x4 mm Allen screws (all become visible when the connectors are removed) and remove the PCM.

To insert a new PCM follow the instructions above in reverse order.

Important

After installing a new PCM you must update the calibration data. For instructions see *Updating VIM/PCM calibration data* on page 9-89.

9.5.7 Replacing motor and encoder

The ADU is equipped with three (3) DC-motors, two of which are identical, and one (1) step motor, for the axes:

- Elevation (DC motor).
- Azimuth (DC motor).
- Cross Elevation (DC motor).
- Polarisation motor (step motor).

The DC-motors are all brush less motors, controlled by their individual DDM. The step motor is controlled by its PMM. To each of the DC-motors and step motor a corresponding encoder provides feedback of its position.

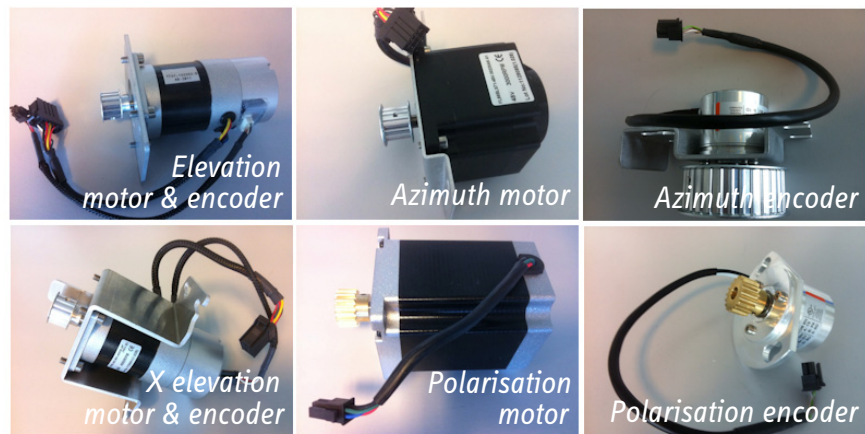


Figure 9-34: Motors and encoders

For step-by-step instructions see:

Removing the Elevation Motor and Encoder on page 9-35

Inserting a new Elevation Motor and Encoder on page 9-37

Removing the Azimuth Motor on page 9-40

Inserting a new Azimuth Motor on page 9-43

Removing the Azimuth Encoder on page 9-45

Inserting a new Azimuth Encoder on page 9-47

Removing the X Elevation Motor and Encoder on page 9-49

Inserting a new X Elevation Motor and Encoder on page 9-51

Removing the Polarisation Motor on page 9-53

Inserting a new Polarisation Motor on page 9-53

Removing the Polarisation Encoder on page 9-54

Inserting a new Polarisation Encoder on page 9-54

9.5.7.1 Removing the Elevation Motor and Encoder

To remove the Elevation Motor and Encoder, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

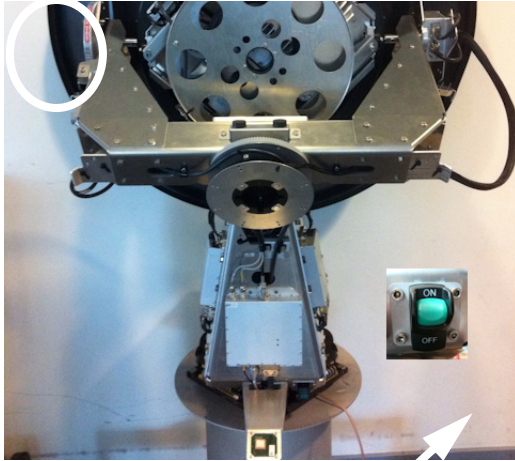


Figure 9-35: Location of the Elevation Motor & Encoder

3. Rotate the Antenna Pedestal so motor assembly and elevation belt faces the service hatch.
4. Loosen the belt tension device by loosening the 4x4 mm Allen screws.

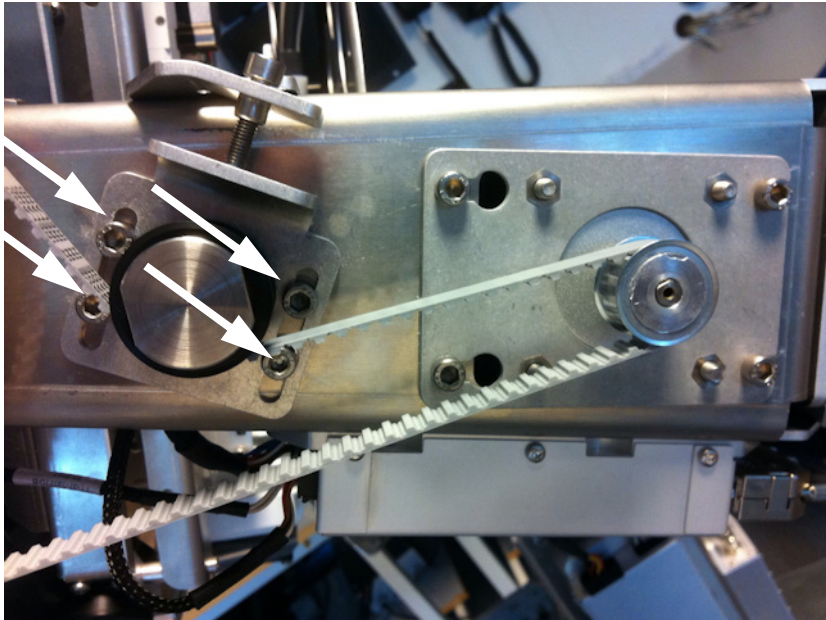


Figure 9-36: Elevation motor and encoder, loosen the belt tensioner

5. Adjust the belt-tension screw to middle position.



Figure 9-37: Elevation Motor and Encoder, adjust belt tension

6. Disconnect the 8-pin connector and the 6-pin connector (colored wires) from the Elevation DDM.



Figure 9-38: Elevation DDM, disconnect 2 connectors

7. Loosen the 4x4 mm Allen screws from the motor assembly.

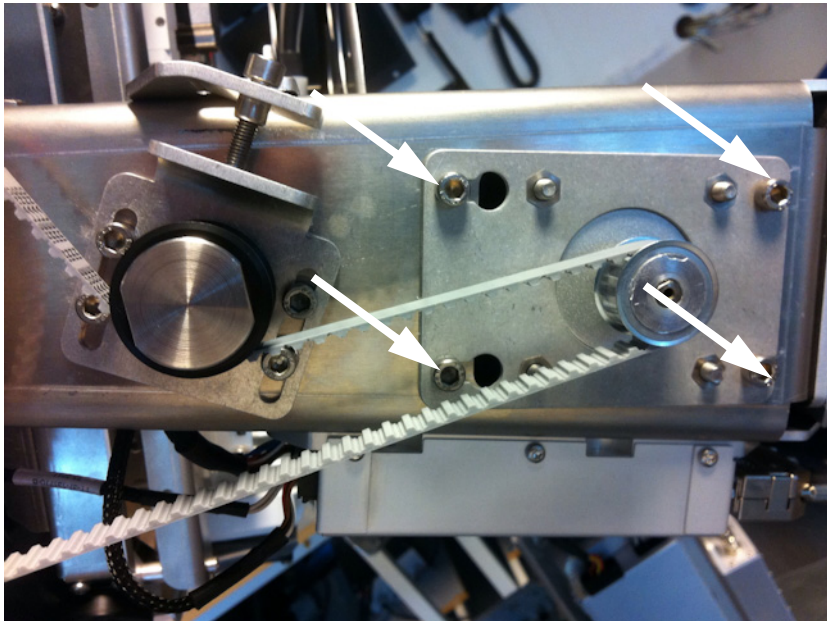


Figure 9-39: Elevation motor and encoder, loosen the screws for the motor assembly

8. Slide free in the key holes of the motor assembly and remove the motor.

9.5.7.2 Inserting a new Elevation Motor and Encoder

To insert a new Elevation Motor and Encoder follow the instructions above in reverse order – **while observing the following guidelines:**

1. String the Elevation belt around the pulley of the motor assembly and below the belt tensioner.

2. Tighten the 4x4 mm Allen screws from the motor assembly.

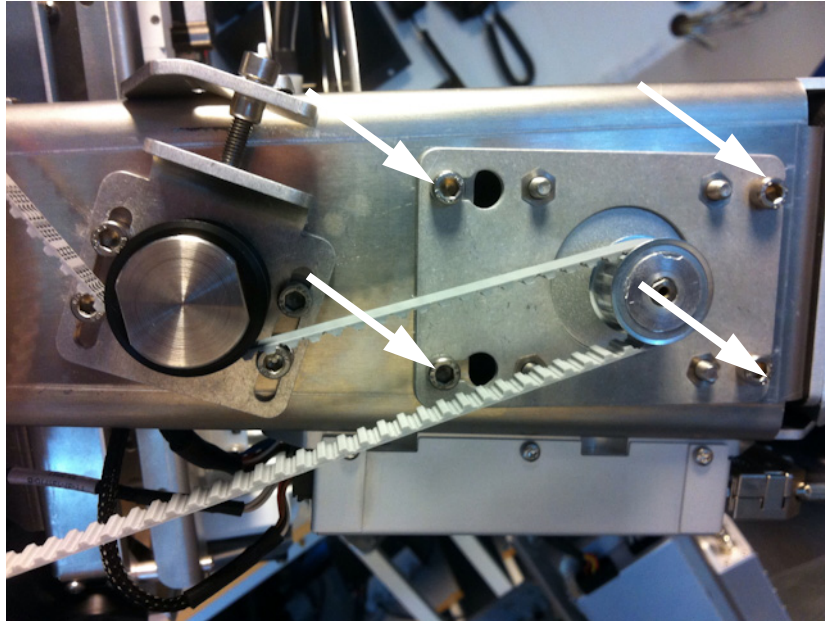


Figure 9-40: Elevation motor and encoder, tighten the screws for the motor assembly

3. Adjust the belt-tension screw.

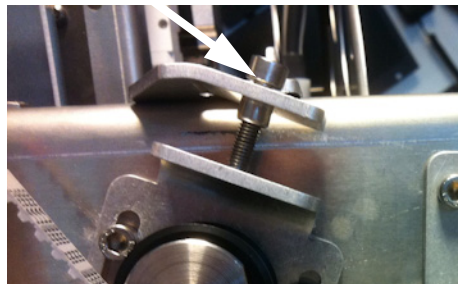


Figure 9-41: Elevation motor and encoder, adjust belt tension

The tension of the belt is 60-80 Hz on average (use an Optibel frequency measuring device or alike), with the antenna disk in two positions – dish elevation position 1 (125 °) and position 2 (-25 °).

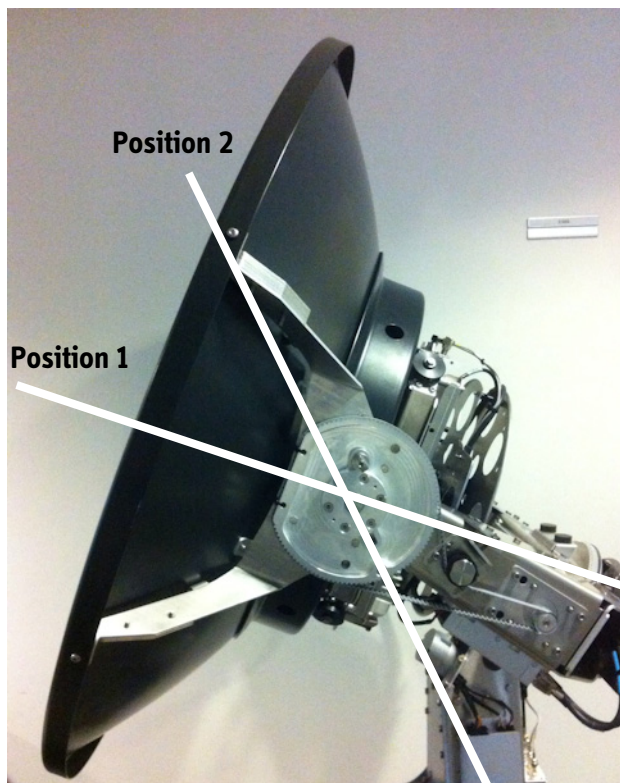


Figure 9-42: Elevation motor and encoder, check of belt tension

4. Tighten the belt tension device by tightening the 4x4 mm Allen screws.

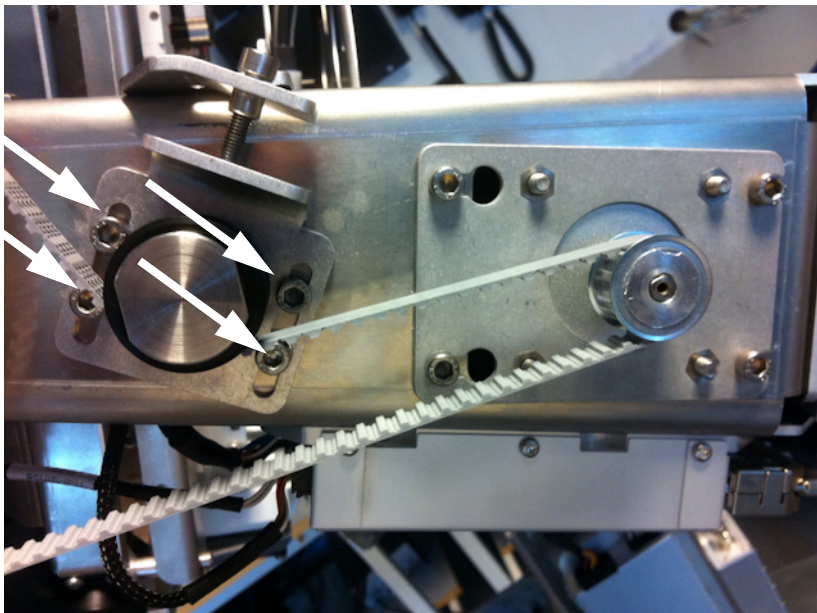


Figure 9-43: Elevation motor and encoder, loosen the belt tensioner

5. Check the tension of the belt again (60-80 Hz). If needed, repeat the tension adjustment.

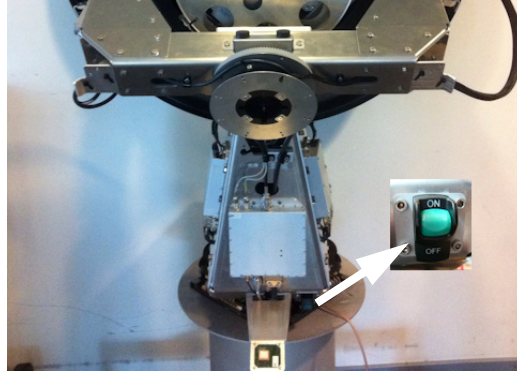
9.5.7.3 Removing the Azimuth Motor

To remove the Azimuth Motor, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



3. Rotate the Antenna Dish to top position.
4. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.
5. Rotate the antenna pedestal so that the Azimuth DDM faces from the service hatch.

6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

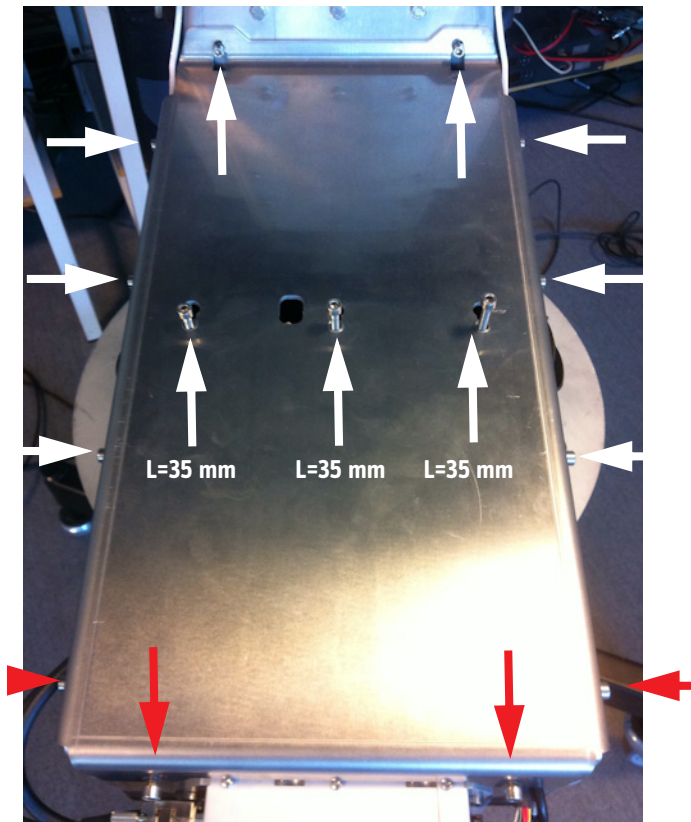


Figure 9-44: Azimuth motor, remove cover

7. Loosen the belt tension device by loosening the 4x4 mm Allen screws.



Figure 9-45: Azimuth motor, loosen the belt tensioner

8. Adjust the belt-tension screw to middle position.



Figure 9-46: Azimuth motor, adjust belt tension

9. Disconnect the 8-pin connector from the Azimuth DDM.

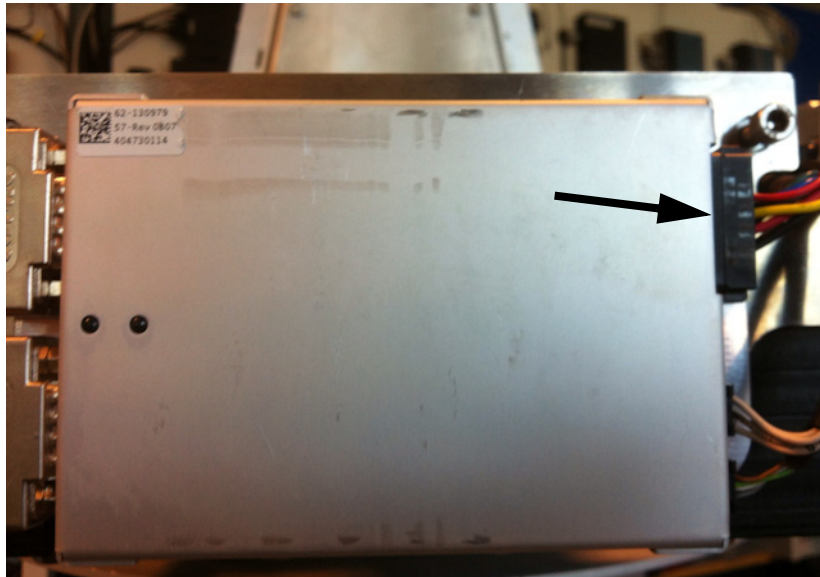


Figure 9-47: Azimuth DDM, disconnect connector

10. Loosen the 4x4 mm Allen screws from the motor assembly.

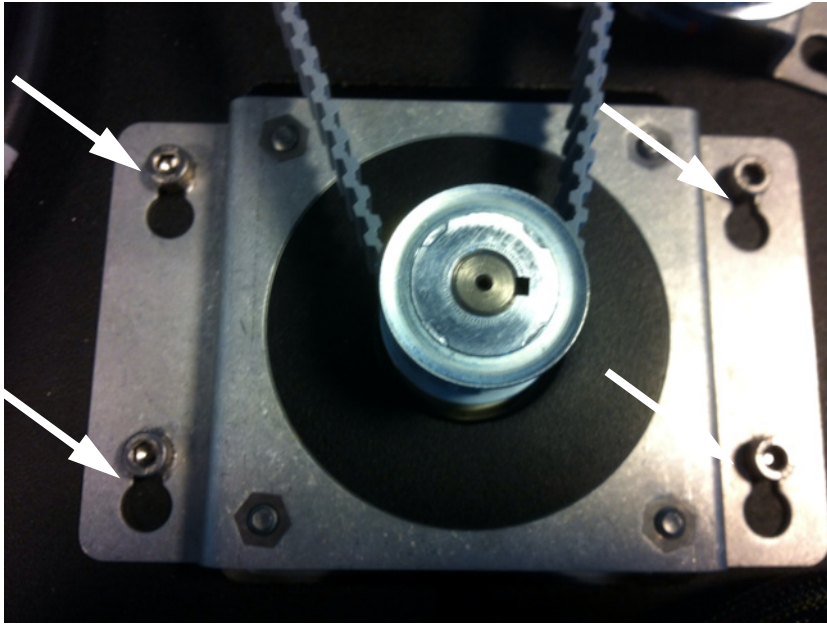


Figure 9-48: Azimuth motor, loosen the screws for the motor assembly

11. Slide free in the key holes of the motor assembly and remove the motor.

9.5.7.4 Inserting a new Azimuth Motor

To insert a new Azimuth Motor follow the instructions above in reverse order – **while observing the following guidelines:**

1. String the Azimuth belt around the pulley of the motor assembly and around the belt tensioner.

2. Tighten the 4x4 mm Allen screws from the motor assembly.

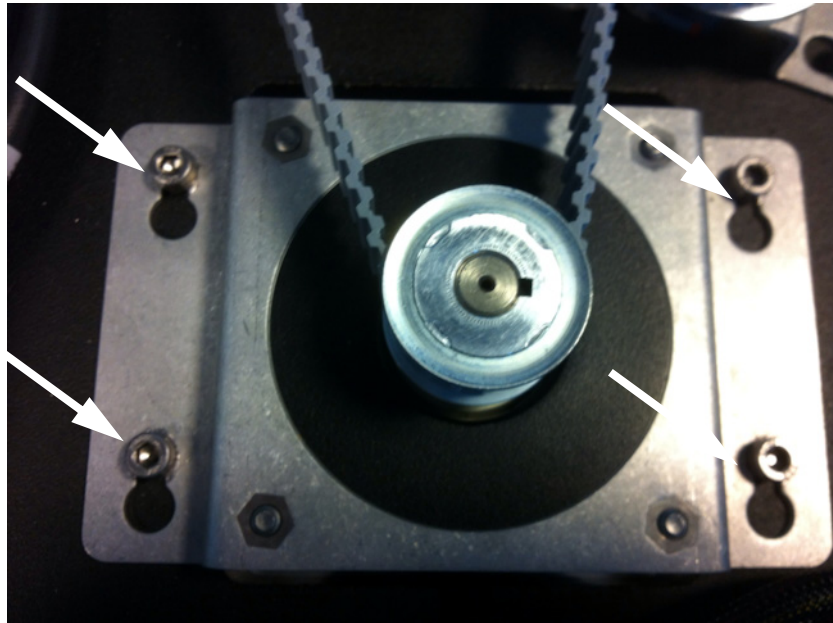


Figure 9-49: Azimuth motor, tighten the screws for the motor assembly

3. Adjust the belt tension using the belt-tension adjustment screw.



Figure 9-50: Azimuth motor, adjust belt tension

The tension of the belt is 90-100 Hz on average (use an Optibel frequency measuring device or alike).

4. Tighten the belt tension device by tightening the 4x4 mm Allen screws.



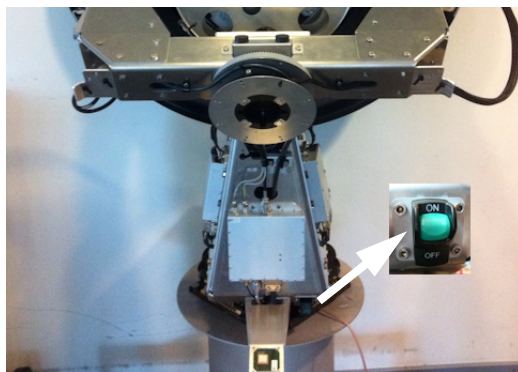
Figure 9-51: Azimuth motor, tighten the belt tensioner

5. Check the tension of the belt again (90-100 Hz). If needed, repeat the tension adjustment.

9.5.7.5 Removing the Azimuth Encoder

To remove the Azimuth Encoder, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

3. Rotate the Antenna Dish to top position.
4. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.
5. Rotate the antenna pedestal so that the Azimuth DDM faces from the service hatch.

6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

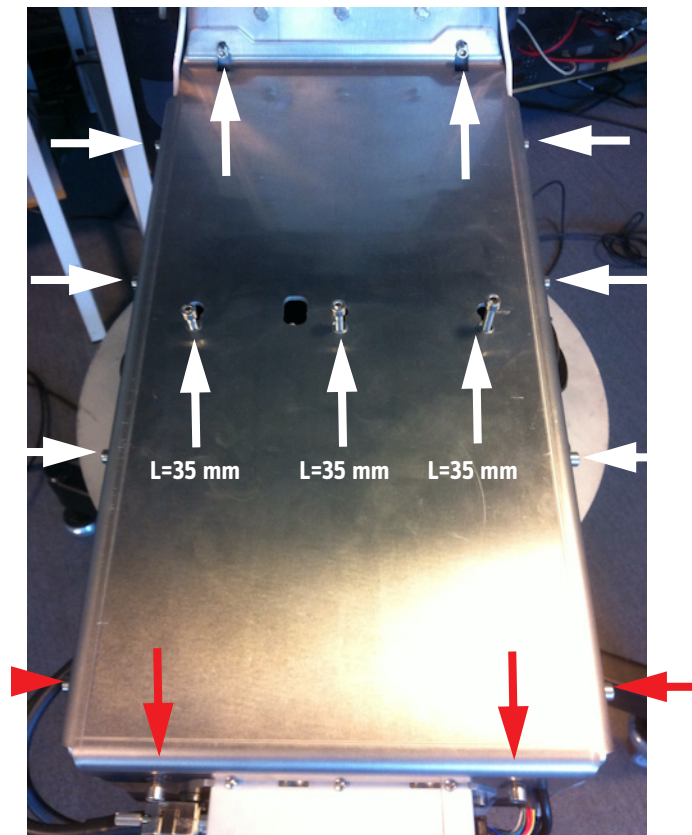


Figure 9-52: Azimuth encoder, remove cover

7. Disconnect the 6-pin connector (colored wires) from the Azimuth DDM.



Figure 9-53: Azimuth DDM, disconnect connector

8. Loosen the belt tension device by loosening the 4x4 mm Allen screws and slide out the Azimuth Encoder.



Figure 9-54: Azimuth encoder, remove

9. Adjust the belt-tension screw to middle position.



Figure 9-55: Azimuth encoder, adjust belt tension

9.5.7.6 Inserting a new Azimuth Encoder

To insert a new Azimuth Encoder follow the instructions above in reverse order – **while observing the following guidelines:**

1. String the Azimuth belt around the pulley of the motor assembly and left around the encoder/belt tensioner.

2. Adjust the belt tension using the belt-tension adjustment screw.



Figure 9-56: Azimuth Encoder, adjust belt tension

The tension of the belt is 90-100 Hz on average (use an Optibel frequency measuring device or alike).

3. Tighten the belt tension device by tightening the 4x4 mm Allen screws.



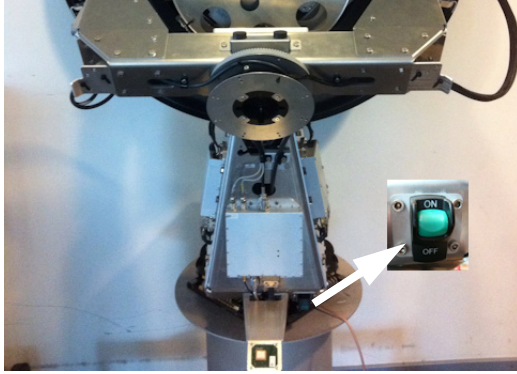
Figure 9-57: Azimuth motor, tighten the belt tensioner

4. Check the tension of the belt again (90-100 Hz). If needed, repeat the tension adjustment.

9.5.7.7 Removing the X Elevation Motor and Encoder

To remove the Cross Elevation Motor and Encoder, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

**Tools needed:**

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

3. Rotate the antenna dish to top position.
4. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.
5. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.
6. Disconnect the 3 cables at the top of the Cross Elevation DDM.



Figure 9-58: Replacement of X-Elevation Motor & Encoder 1

7. Loosen the Cross-Elevation Drive belt tension/adjustment screw.

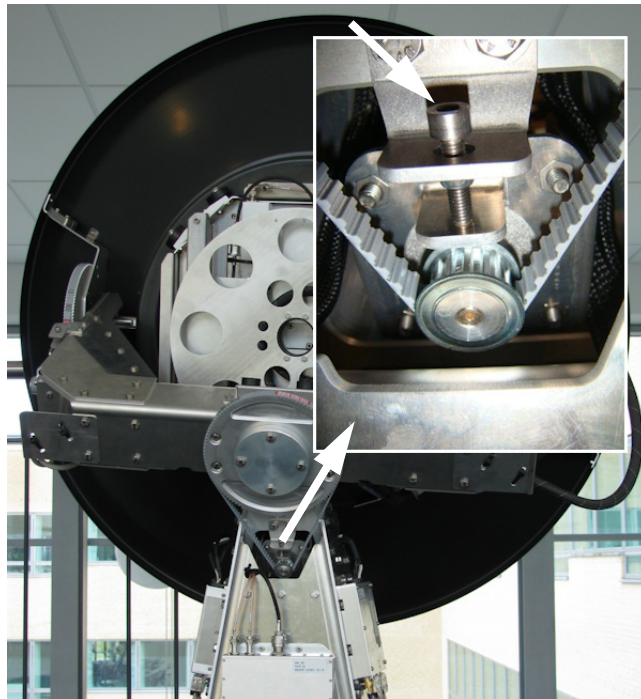


Figure 9-59: X-Elevation Motor & Encoder – belt tension/adjustment screw

8. Loosen the 4x4 mm Allen screws of the motor assembly.

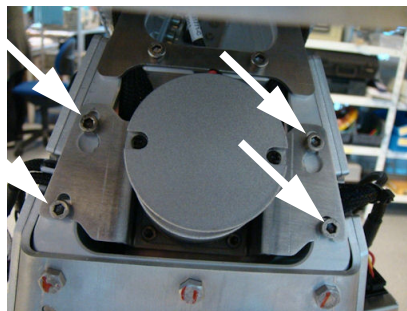


Figure 9-60: Cross Elevation motor assembly, 4 Allen screws

9. Lift the complete Cross Elevation Motor & Encoder assembly free, in the key holes, from the pedestal and remove it.

9.5.7.8 Inserting a new X Elevation Motor and Encoder

To insert a new Cross Elevation Motor & Encoder follow the instructions above in reverse order – **while observing the following mounting guidelines:**

1. Do not tighten the 4x4 mm Allen screws of the motor assembly.

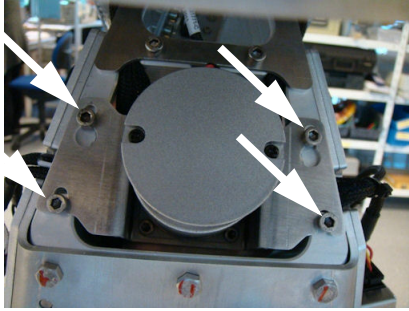


Figure 9-61: Cross Elevation motor assembly, do not tighten screws

2. Adjust the belt tension using the belt tension/adjustment screw.

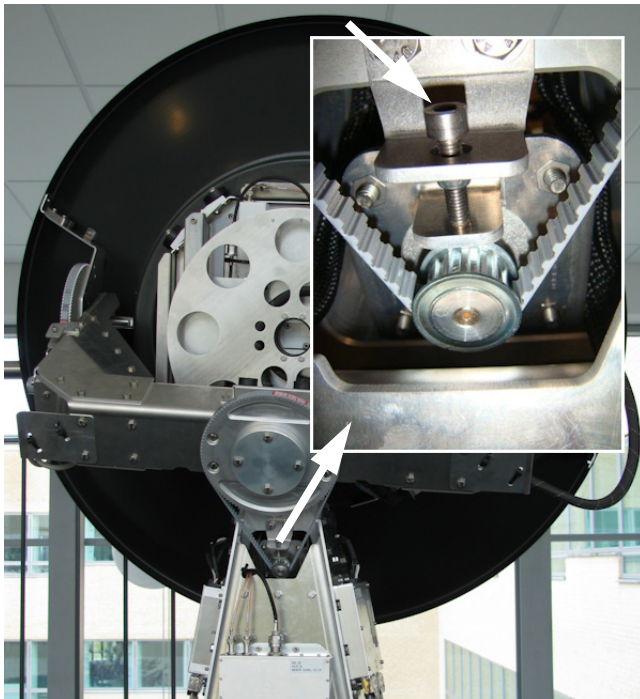


Figure 9-62: X-Elevation Motor & Encoder – adjust belt tension

The tension of the belt is 80–100 Hz on average, with the cross elevation beam in 3 positions.

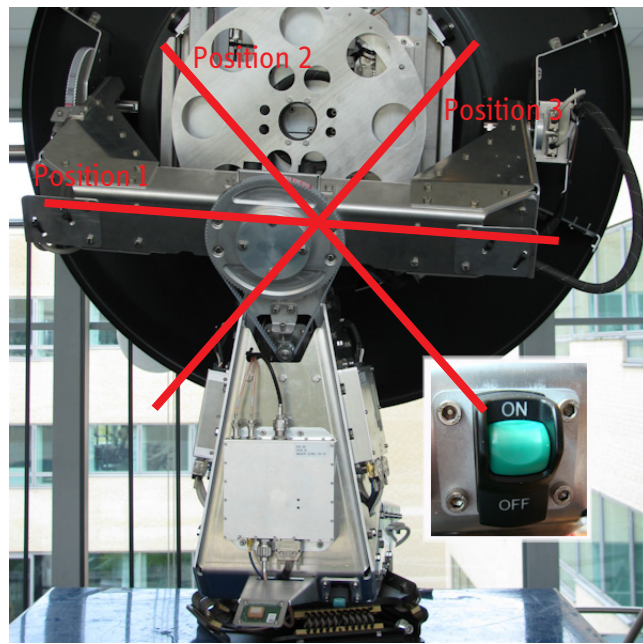


Figure 9-63: Belt tension in 3 positions

3. Now tighten the 4x4 mm Allen screws of the Cross Elevation Motor & Encoder assembly.

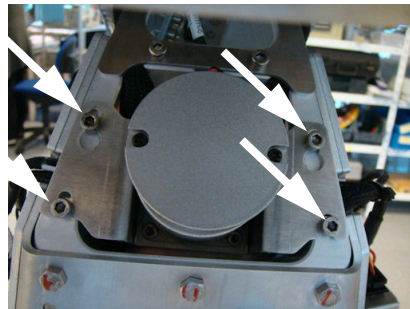


Figure 9-64: Cross Elevation motor assembly, tighten screws

4. Check the tension of the belt again (80-100 Hz). If needed, repeat the tension adjustment.

9.5.7.9 Removing the Polarisation Motor

To remove the Polarisation Motor, do as follows:

1. Follow the instructions in *Removing the Polarisation Unit* on page 9-73.
2. Disconnect the power connector of the Polarisation Motor.

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver



Figure 9-65: Polarisation Motor, disconnecting power

3. Remove the 4x4 mm Allen screws that hold the motor.

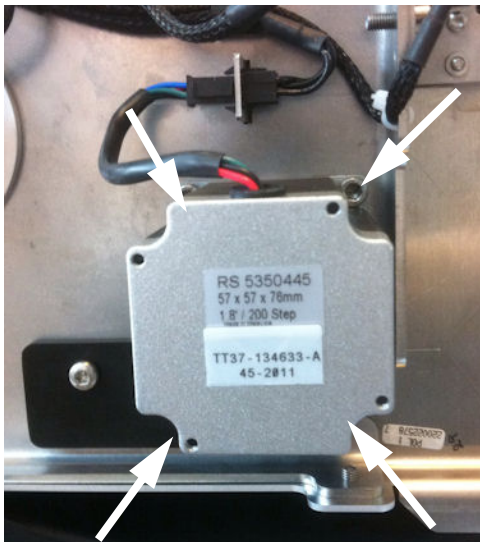


Figure 9-66: Polarisation Motor, removing 4x4 mm Allen screws

4. Remove the Polarisation Motor.

9.5.7.10 Inserting a new Polarisation Motor

To insert a new Polarisation Motor follow the instructions above in reverse order.

9.5.7.11 Removing the Polarisation Encoder

To remove the Polarisation Encoder, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

1. Follow the instructions in *Removing the Polarisation Unit* on page 9-73.
2. Disconnect the 6-pin connector (with the colored wires) from the PMM, marked **ORE**, and free the cable to the Polarisation Encoder.

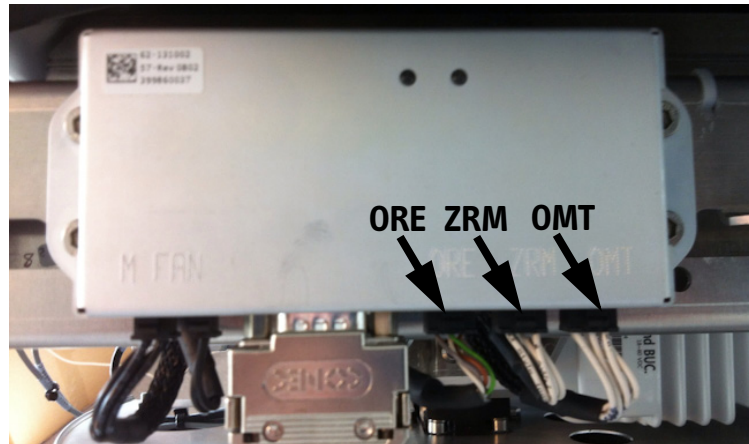


Figure 9-67: Removing the sub-D connector of the PMM

3. Loosen the 2x4 mm Allen screws and rotate the Polarisation Encoder in the key holes.

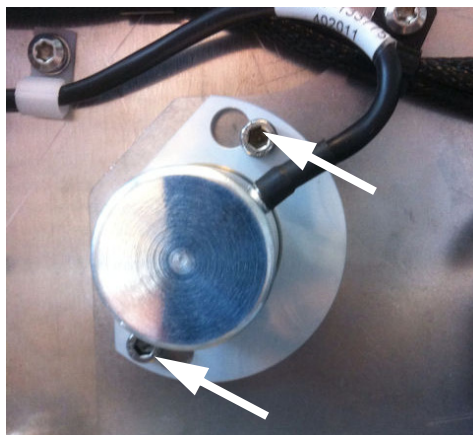


Figure 9-68: Polarisation Encoder, removing

4. Free the Polarisation Encoder from the cable holders.
5. Remove the Polarisation Encoder.

9.5.7.12 Inserting a new Polarisation Encoder

To insert a new Polarisation Motor follow the instructions above in reverse order.

9.5.8 Replacing the Drive Belts

The ADU has 3 drive belts:

- X Elevation drive belt
- Elevation drive belt
- Azimuth drive belt

For step-by-step instructions see:

Removing the X Elevation Drive Belt on page 9-55

Inserting a new X Elevation Drive Belt on page 9-56

Removing the Elevation Drive Belt on page 9-57

Inserting a new Elevation Drive Belt on page 9-59

Removing the Azimuth Drive Belt on page 9-60

Inserting a new Azimuth Drive Belt on page 9-63

9.5.8.1 Removing the X Elevation Drive Belt

To remove the X Elevation Drive Belt, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

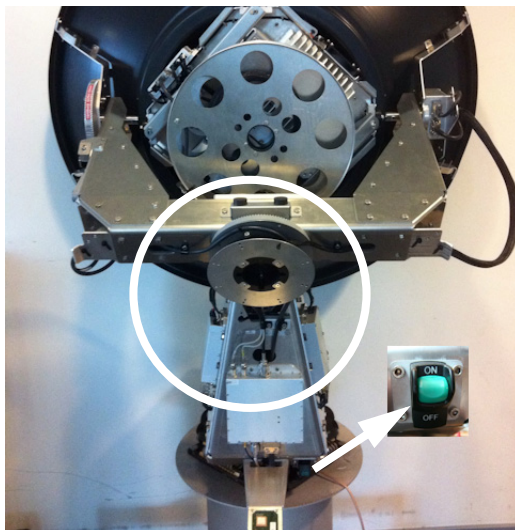


Figure 9-69: Location of the X Elevation Drive Belt

3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.

4. Loosen the Cross Elevation Drive Belt tension adjustment screw, see **Figure 9-59: X-Elevation Motor & Encoder – belt tension/adjustment screw**.
5. Loosen the 4x4 mm Allen screws of the motor assembly, see **Figure 9-60: Cross Elevation motor assembly, 4 Allen screws**.
6. Remove the cable drum by removing the 4x4 mm Allen screws and leave the cable drum hanging in the cables.

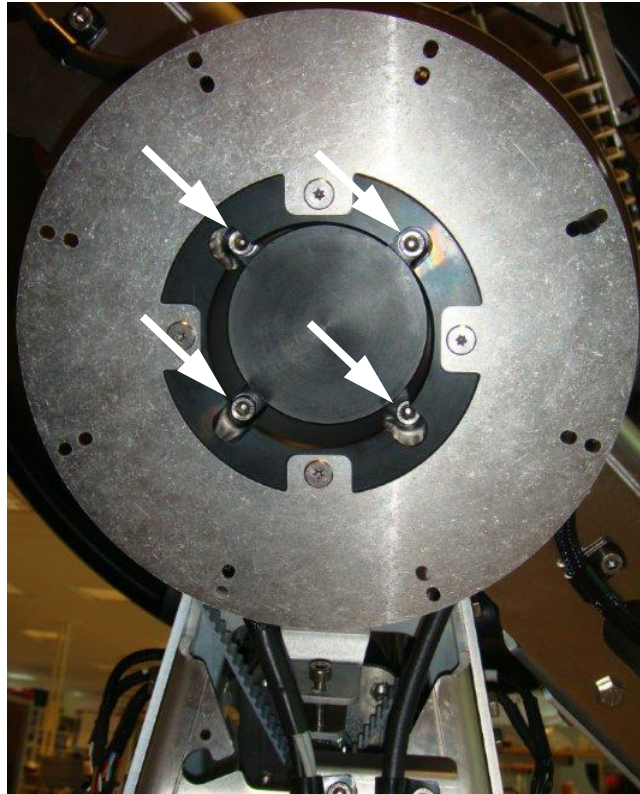


Figure 9-70: Removing the cable drum

7. Remove the Cross Elevation Drive Belt.

9.5.8.2 Inserting a new X Elevation Drive Belt

To insert a new X Elevation Drive Belt the instructions above in reverse order – **while observing the following mounting guidelines:**

Follow the instructions given in *Inserting a new X Elevation Motor and Encoder* on page 9-51.

9.5.8.3 Removing the Elevation Drive Belt

To remove the Elevation Drive Belt, do as follows:

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

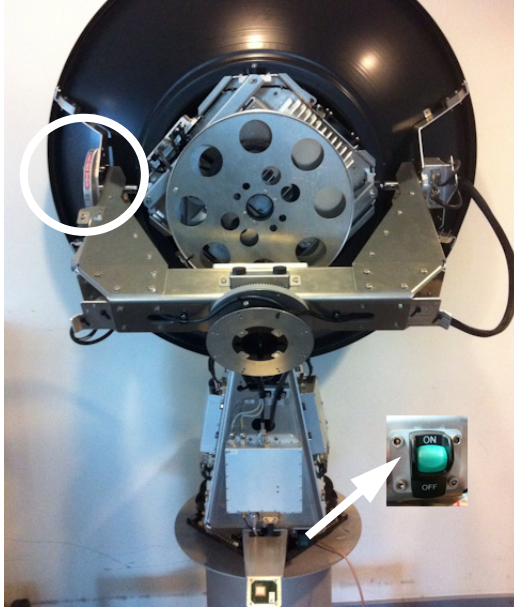


Figure 9-71: Location of the Elevation Drive Belt

3. Rotate the Antenna Pedestal so the Elevation Drive Belt faces the service hatch.

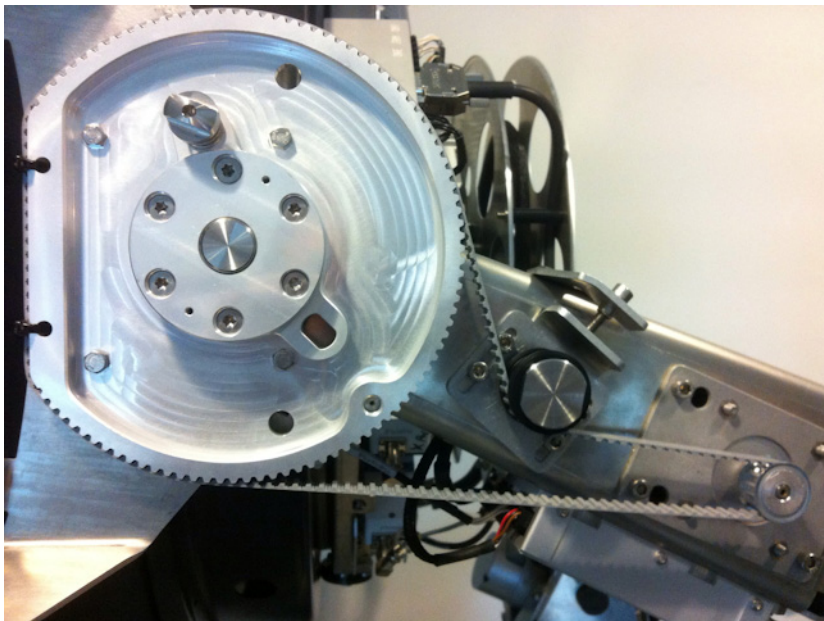


Figure 9-72: Elevation Drive Belt

4. Press in and turn the elevation locking pin (only available from S/N TBD) to locked position.
5. Loosen the belt tension device by loosening the 4x4 mm Allen screws.

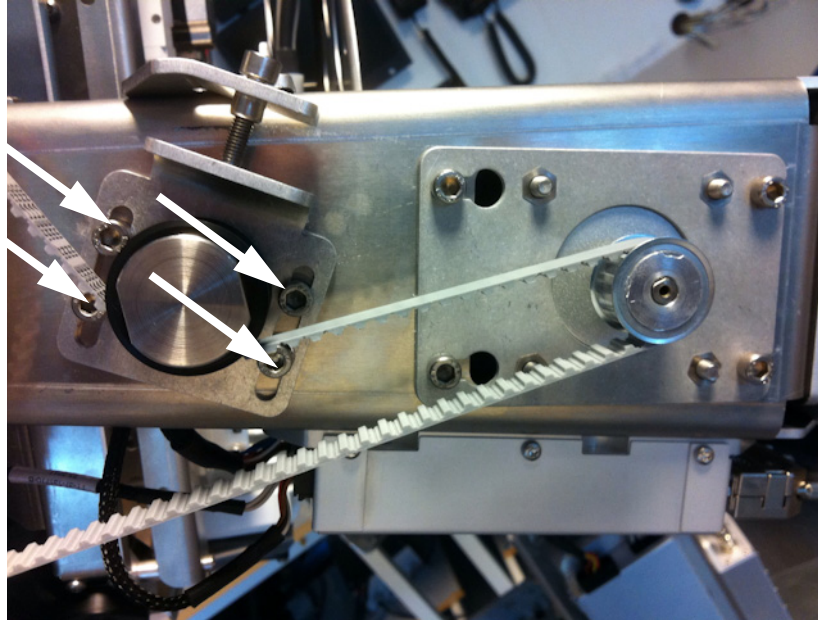


Figure 9-73: Elevation motor and encoder, loosen the belt tensioner

6. Adjust the belt-tension screw to middle position.



Figure 9-74: Elevation motor and encoder, adjust belt tension

7. Cut the two plastic tie-wraps on the elevation drive wheel.

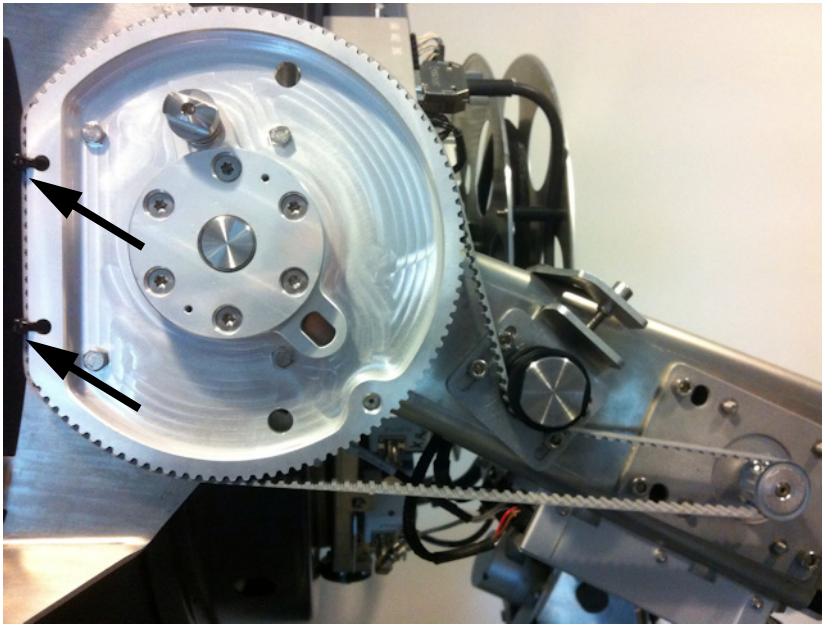


Figure 9-75: Elevation Drive Belt

8. Remove the Elevation Drive Belt.

9.5.8.4 Inserting a new Elevation Drive Belt

To insert a new Elevation Belt follow the instructions above in reverse order – while observing the following guidelines:

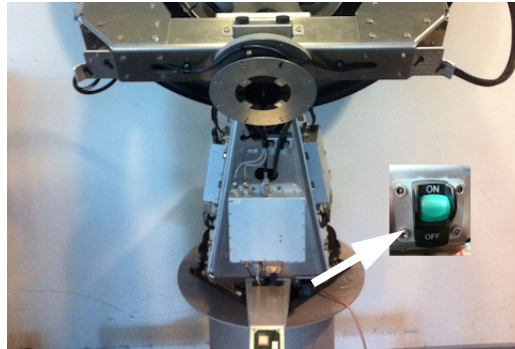
Follow the instructions in *Inserting a new Elevation Motor and Encoder* on page 9-37.

9.5.8.5 Removing the Azimuth Drive Belt

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch and
4. Rotate the Antenna Dish to top position.
5. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.
6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

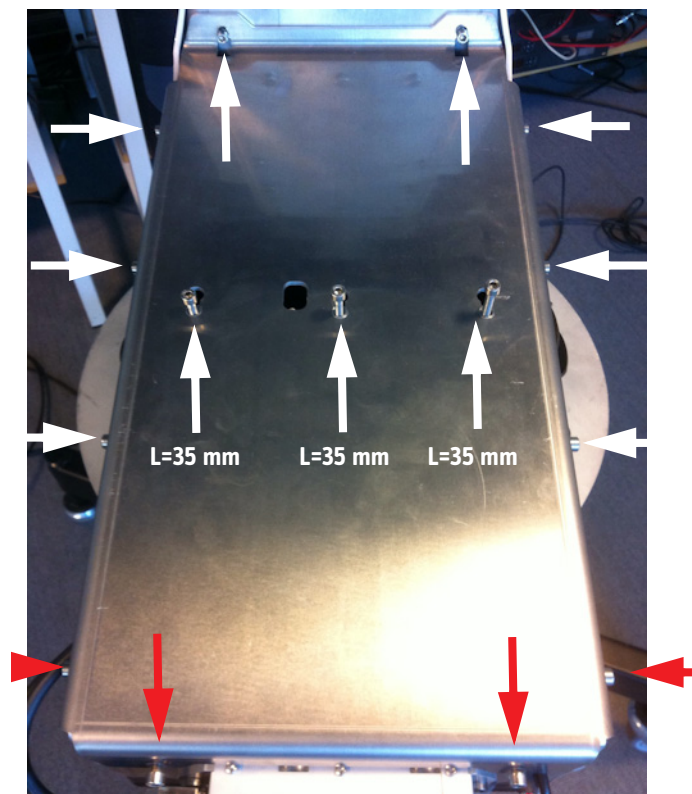


Figure 9-76: Azimuth drive modules, remove cover

7. Loosen the belt tension device by loosening the 4x4 mm Allen screws.



Figure 9-77: Azimuth drive belt, loosen the belt tensioner

8. Adjust the belt-tension screw to middle position.



Figure 9-78: Azimuth drive belt, adjust belt tension

9. Remove the RF connector (N-type, finger nut) from the Rotary Joint.

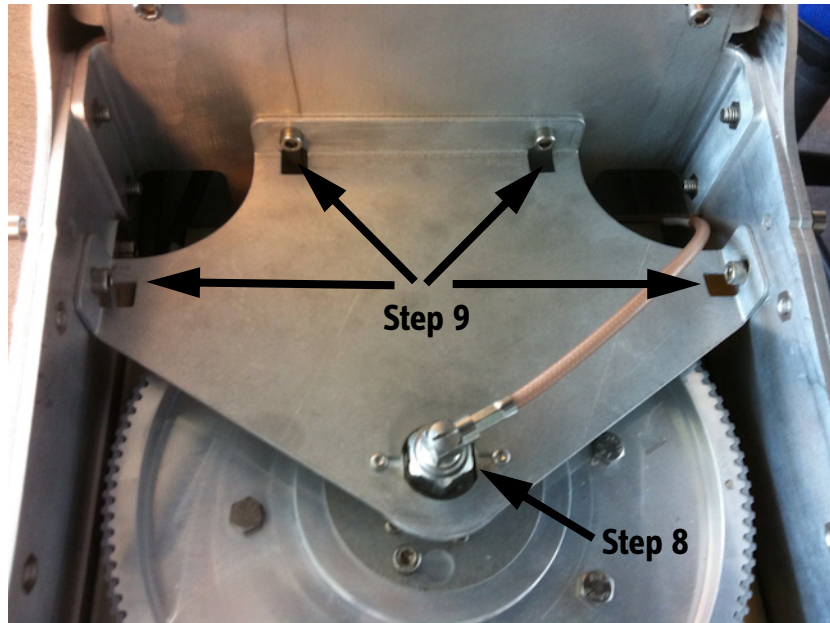


Figure 9-79: Getting access to the azimuth drive wheel

10. Loosen the 4x4 mm Allen screws from the cover plate over the azimuth drive wheel.
11. Remove the cover plate.
12. Remove the Azimuth Drive Belt.

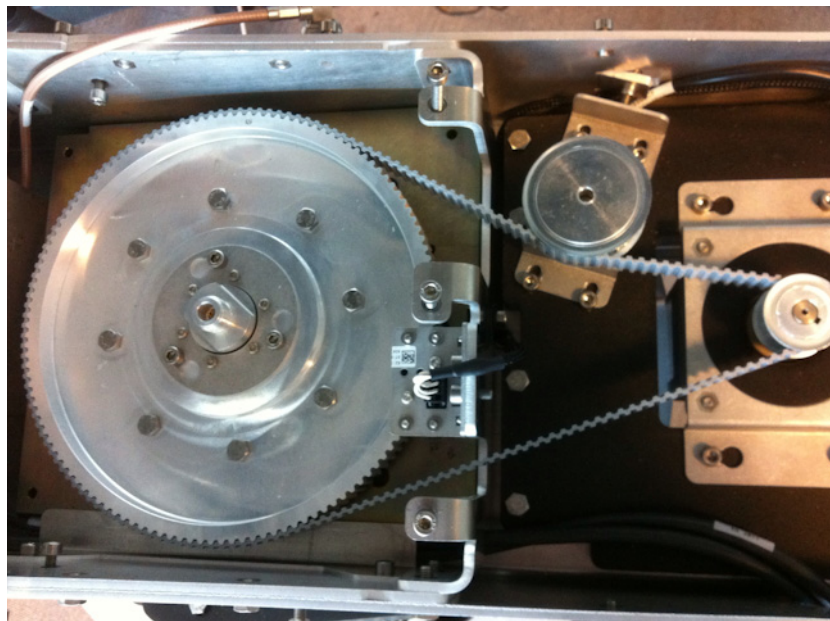


Figure 9-80: Azimuth Drive Belt

9.5.8.6 Inserting a new Azimuth Drive Belt

To insert a new Azimuth Drive Belt follow the instructions above in reverse order - while observing the following guidelines:

Follow the instructions in *Inserting a new Azimuth Motor* on page 9-43.

9.5.9 Replacing the Zero Reference Module (ZRM)

The ADU has the following identical ZRMs, one for each drive wheel (each axes):

- X Elevation ZRM
- Elevation ZRM
- Azimuth ZRM
- Polarization ZRM

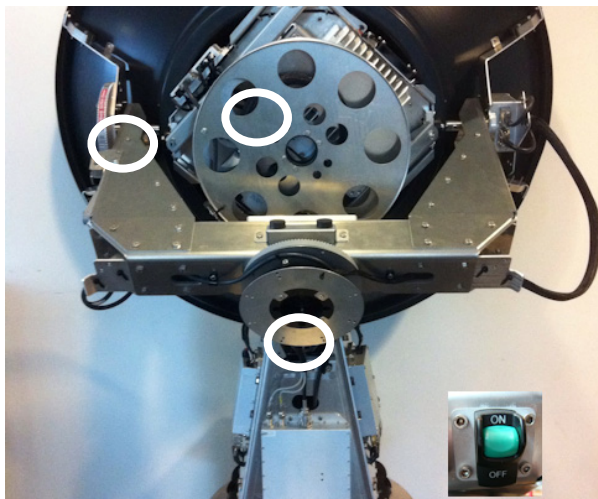


Figure 9-81: Zero Reference Modules (ZRM), location

The ZRM has a Hall sensor detecting a zero point (small magnet mounted on the drive wheel). The zero point signal of the ZRM is sent to the PCM to be used in the orientation of the ADU.

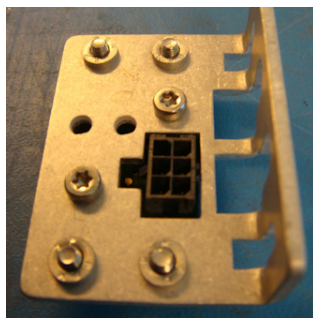


Figure 9-82: Zero Reference Module (ZRM)

For step-by-step instructions see:

Removing the X Elevation ZRM on page 9-64

Inserting a new X Elevation ZRM on page 9-66

Removing the Elevation ZRM on page 9-66

Inserting a new Elevation ZRM on page 9-67

Removing the Azimuth ZRM on page 9-67

Inserting a new Azimuth ZRM on page 9-69

Removing the Polarisation ZRM on page 9-69

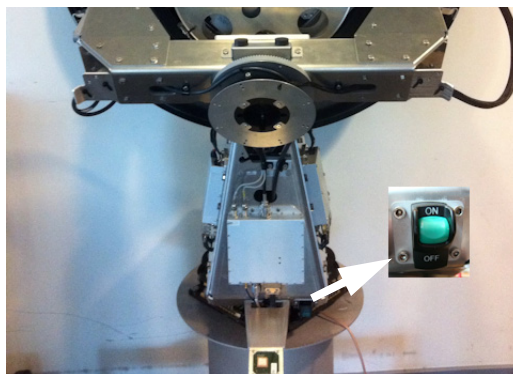
Inserting a new Polarisation ZRM on page 9-70

9.5.9.1 Removing the X Elevation ZRM

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Rotate the antenna dish to top position.
5. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.

6. Disconnect the connector from the Zero Reference Module.

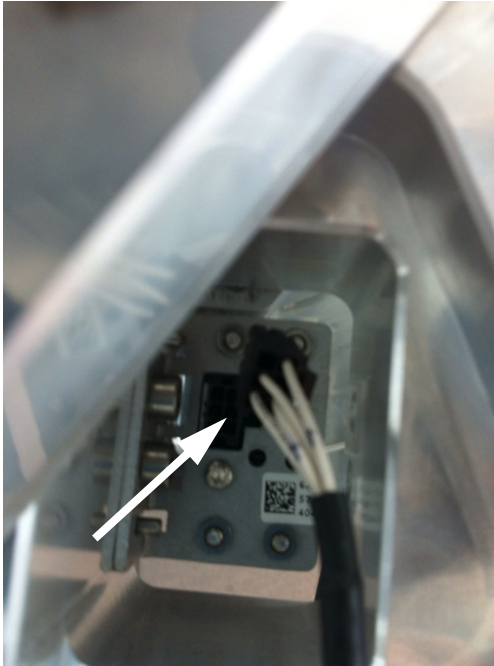


Figure 9-83: X Elevation ZRM, disconnect connector

7. Through the 2 holes (above the Cross Elevation DDM) in the pedestal loosen the 2x4 mm Allen screws.

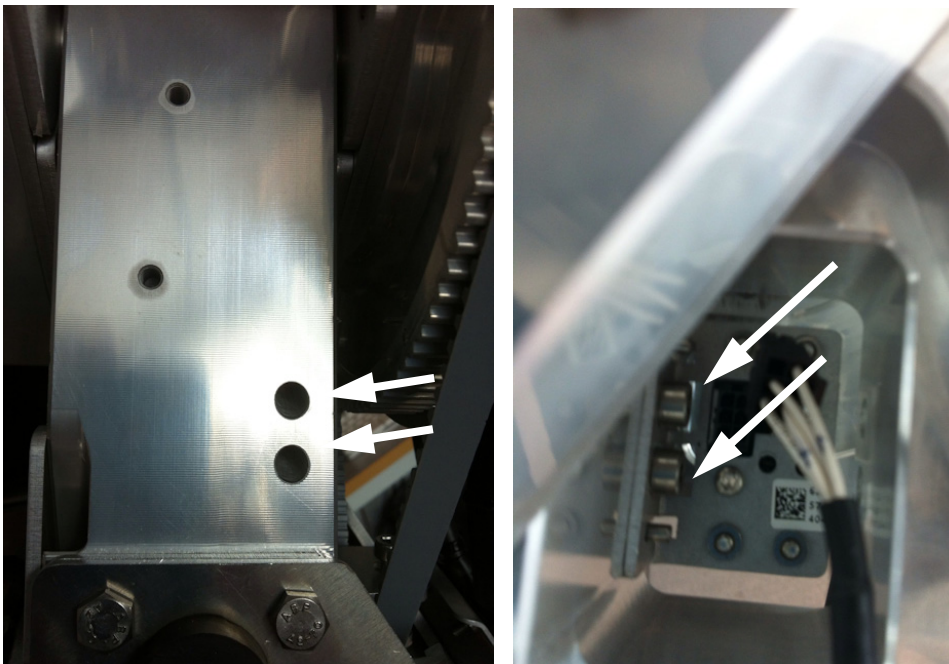


Figure 9-84: X Elevation ZRM, slide out

8. Slide out the X Elevation ZRM.

9.5.9.2 Inserting a new X Elevation ZRM

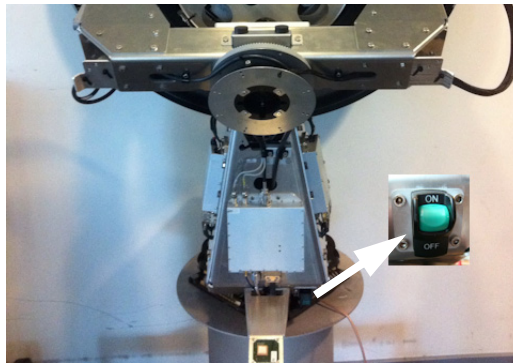
To insert a new X Elevation ZRM follow the instructions above in reverse order.

9.5.9.3 Removing the Elevation ZRM

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



3. Rotate the antenna pedestal so that the Elevation Drive Belt faces the service hatch.
4. Rotate the antenna dish to top position.
5. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.
6. Disconnect the connector from the Elevation ZRM.

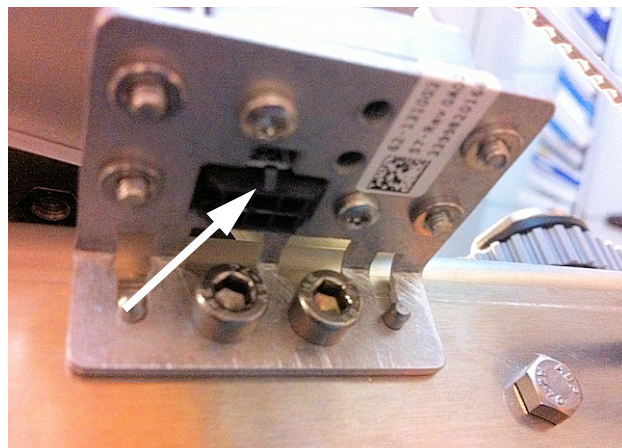


Figure 9-85: Elevation ZRM, disconnect connector

7. Loosen the 2x4 mm Allen screws.

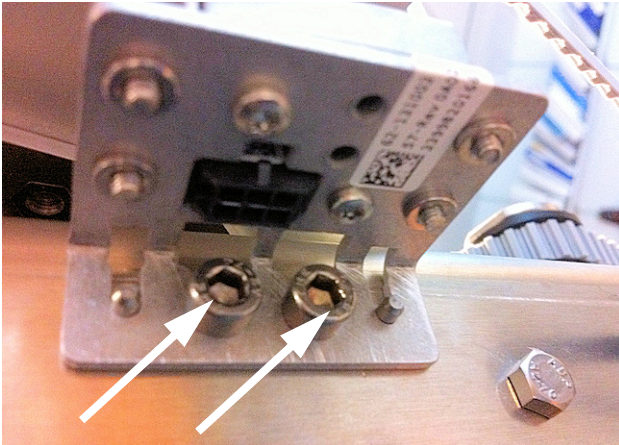


Figure 9-86: Elevation ZRM, remove screws

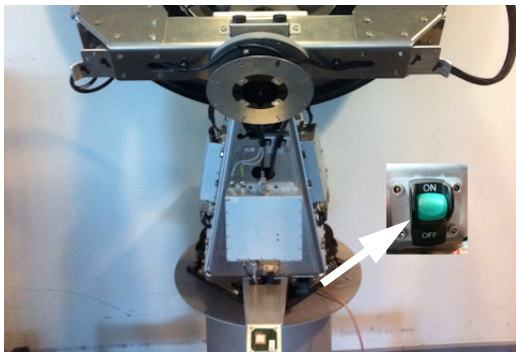
8. Slide out the Elevation ZRM.

9.5.9.4 Inserting a new Elevation ZRM

To insert a new Elevation ZRM follow the instructions above in reverse order.

9.5.9.5 Removing the Azimuth ZRM

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)

3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Rotate the antenna dish to top position.
5. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.

6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

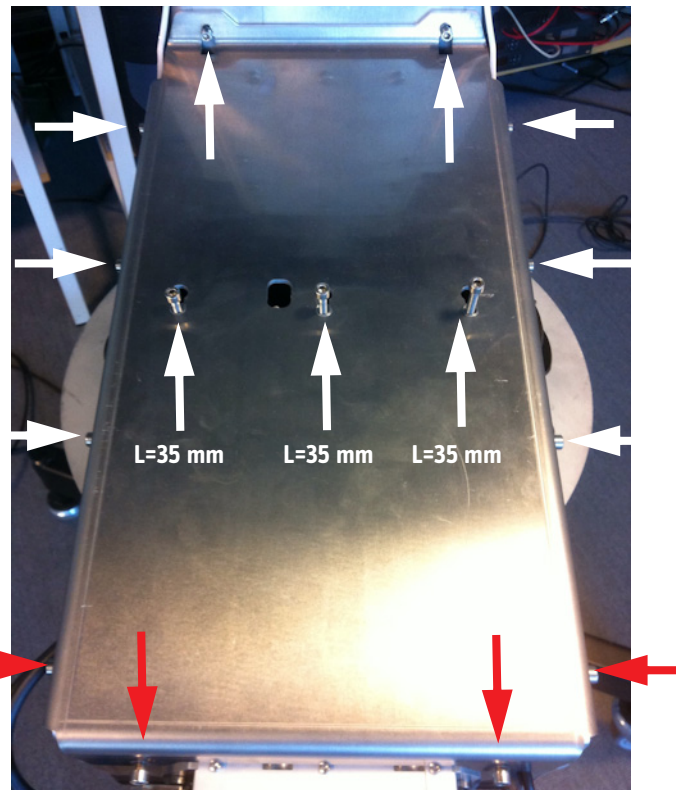


Figure 9-87: Azimuth ZRM, remove cover

7. Disconnect the connector from the Azimuth ZRM.

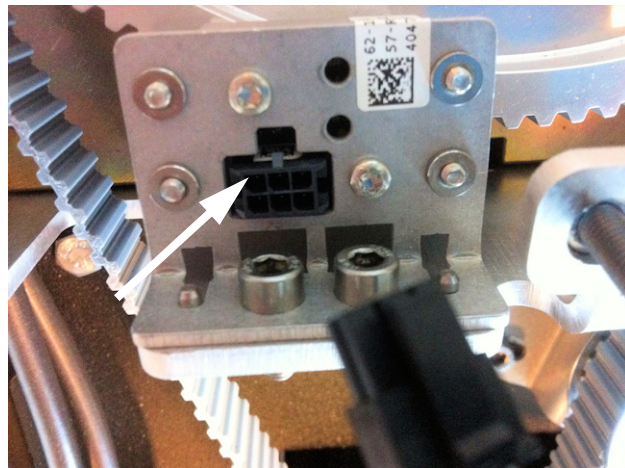


Figure 9-88: Azimuth ZRM, disconnect connector

- Loosen the 2x4 mm Allen screws.

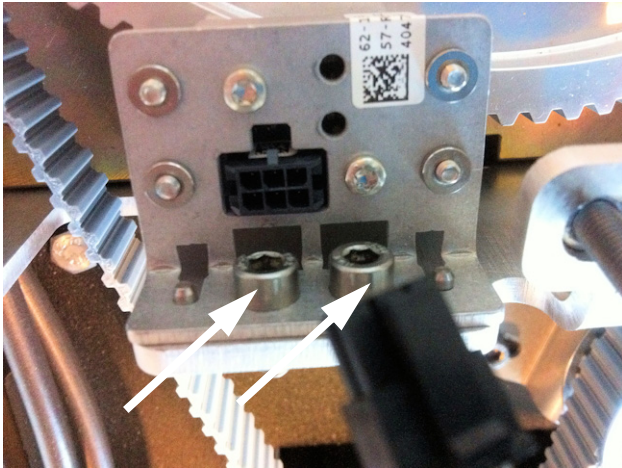


Figure 9-89: Azimuth ZRM, disconnect connector

- Slide out the Azimuth ZRM.

9.5.9.6 Inserting a new Azimuth ZRM

To insert a new Cross Elevation ZRM follow the instructions above in reverse order.

9.5.9.7 Removing the Polarisation ZRM

- Follow the instructions in *Removing the Polarisation Unit* on page 9-73.
- Disconnect the connector from the Polarisation ZRM.



Figure 9-90: Polarisation ZRM, disconnecting

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

3. Loosen the 2x4 mm Allen screws.

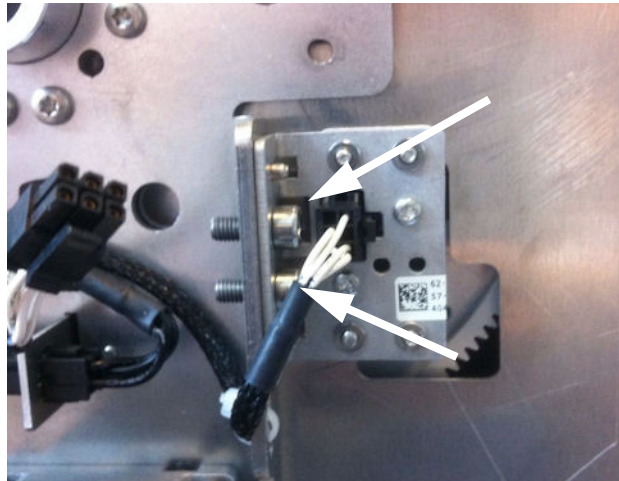


Figure 9-91: Polarisation ZRM, loosen 2x4 mm Allen screws

4. Slide out the Polarisation ZRM.

9.5.9.8 Inserting a new Polarisation ZRM

To insert a new Polarisation ZRM follow the instructions above in reverse order.

9.5.10 Replacing the Inertial Sensor Module (ISM)

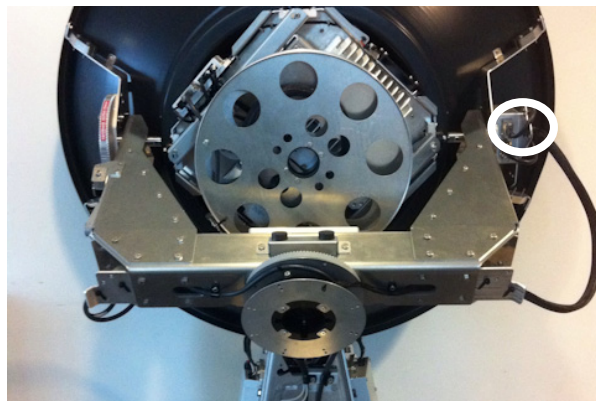


Figure 9-92: Inertial Sensor Module (ISM), location

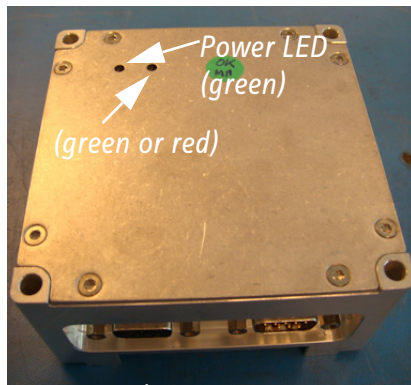


Figure 9-93: Inertial Sensor Module (ISM)

When the antenna dish is moved by the motors and ships motions, in all its plans the ISM provides the information regarding these movements.

This information is based on rate gyro and accelerometers mounted in the ISM.

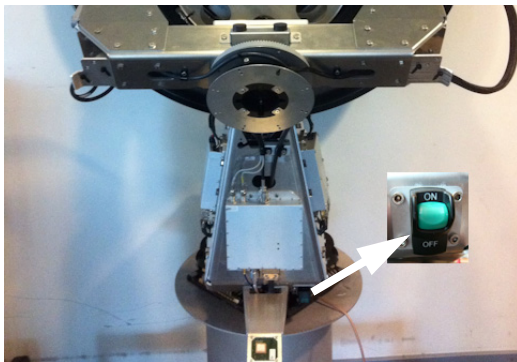
The information is passed on to the PCM.

The ISM has two LEDs for status and troubleshooting:

- Power LED: green or Off
- Service LED: green or red

9.5.10.1 Removing the ISM

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

3. Press in and turn the elevation locking pin (only available from S/N TBD) to locked position.
4. Rotate the antenna so that you can reach the ISM.
5. Loosen the 4x4 mm Allen screws.

6. Slide the cable support free in the key holes, and leave it hanging in the cables.

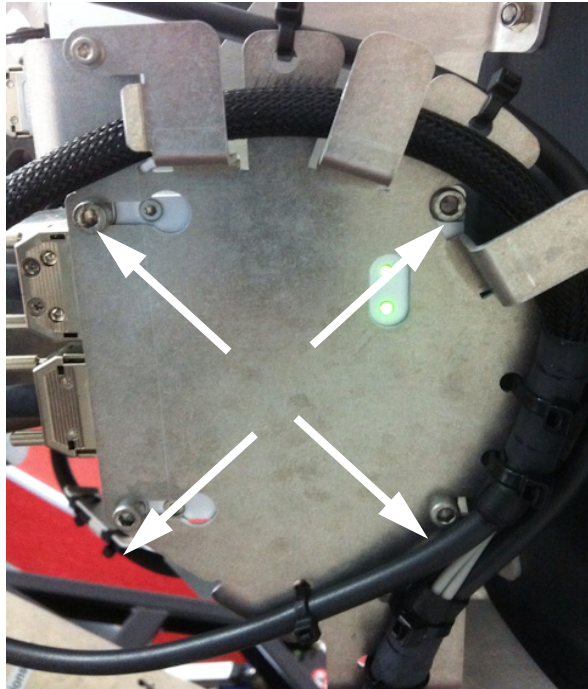


Figure 9-94: Removing the ISM

7. Disconnect the two SUB-D connectors using a small flat screw driver.

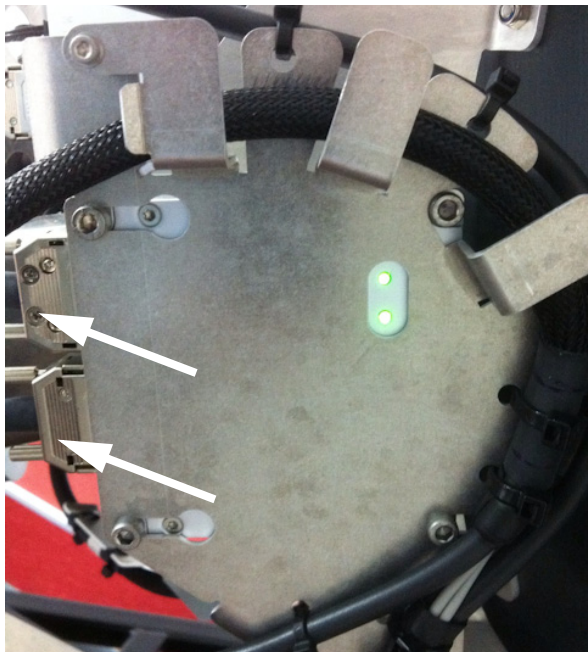


Figure 9-95: Removing the ISM Sub D connectors

8. Remove the 4x4 mm Allen screws, loosened in step 5.
9. Remove the ISM.

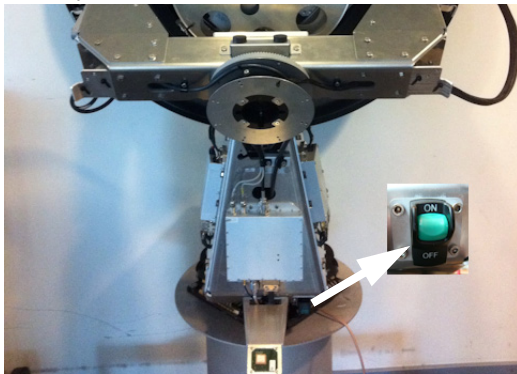
9.5.10.2 Inserting a new ISM

To insert a new Inertial Sensor Module follow the instructions above in reverse order.

9.5.11 Replacing the Polarisation Unit

9.5.11.1 Removing the Polarisation Unit

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.

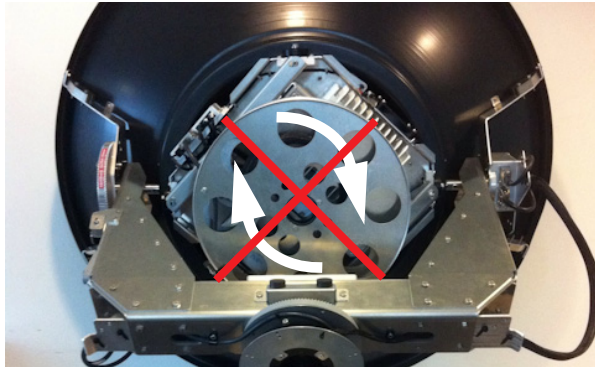
**Tools needed:**

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver
- 11 mm open-end spanner
- 18 mm open-end spanner

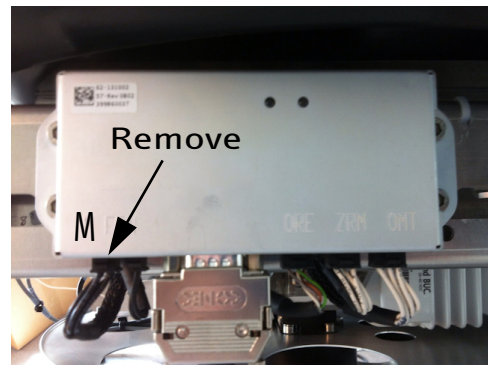
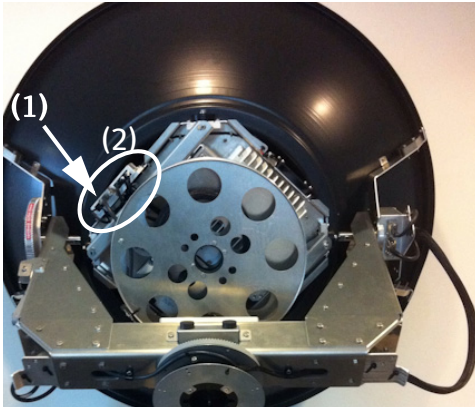
3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Press in and turn the elevation locking pin (only available from S/N TBD) to locked position.



CAUTION! Do not manually turn the Polarisation Unit of the antenna, it may cause damage to the antenna.



Before turning the Polarisation Unit manually, remove the connector (1) marked M of the Polarisation Motor Module (2).



5. Disconnect the SUB-D connector from the PMM.



Figure 9-96: Removing the sub-D connector of the PMM

6. Disconnect the two RF F-connectors from the two LNBs. Mark the LNBs after the label on the wires: **Co-pol (left)** and **X-pol (right)**. Remove also the RF N-connector.

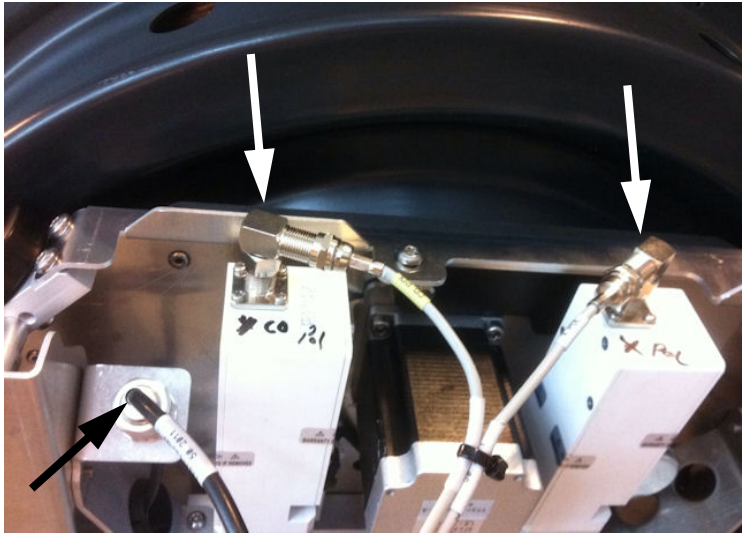


Figure 9-97: Disconnecting the LNBs

7. Remove the 4x4 Allen screws to free the cable spool attached to the PMM. Let the cable spool hang freely in the cables.

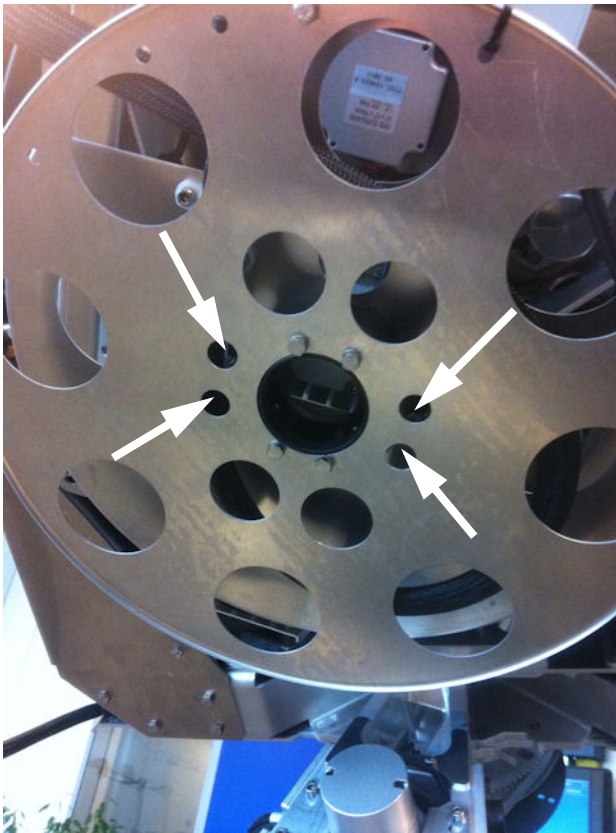


Figure 9-98: Removing the cable spool

8. Disconnect the connector on the OMT.

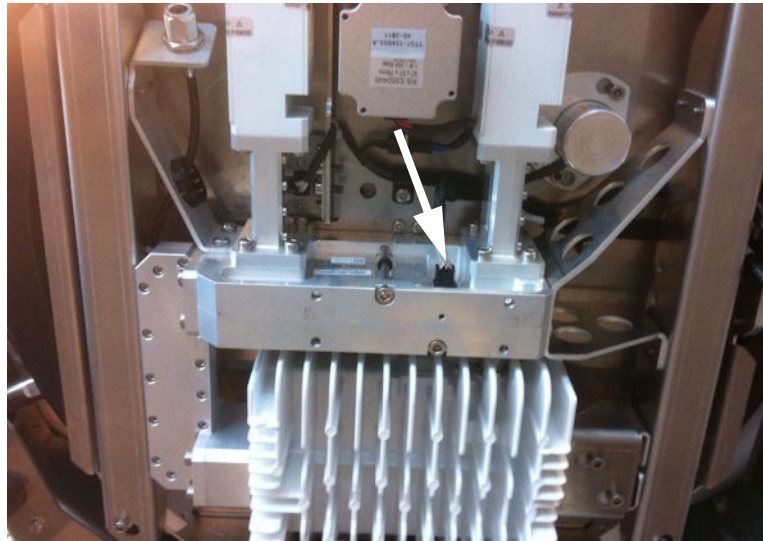


Figure 9-99: Disconnecting the OMT connector

9. Remove the 2x4 mm Allen screws at the OMT and loosen the 4x4 mm Allen screws on the Polarisation Unit.

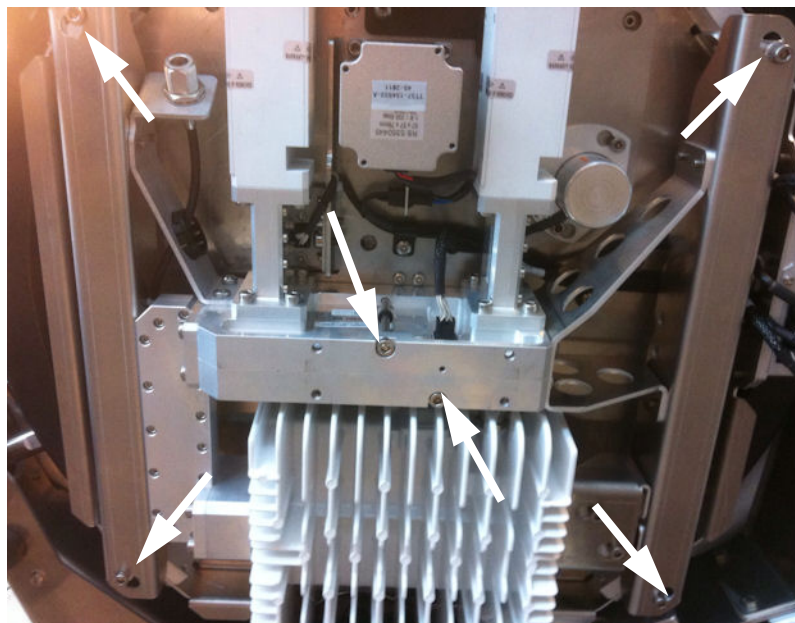


Figure 9-100: Disconnecting the OMT connector

10. Rotate the Polarisation Unit in clockwise direction until end stop.
11. Rotate the Polarisation Unit further in the key holes and remove it.

Note

The Polarisation Unit is attached to the OMT collar to the feeder horn tube on the rear side of the unit.

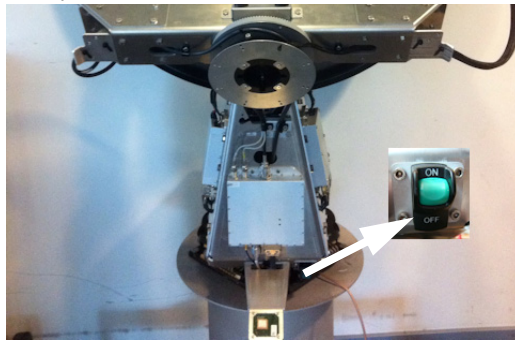
9.5.11.2 Inserting a new Polarisation Unit

To insert a new Polarisation Unit follow the instructions above in reverse order.

9.5.12 Replacing the BUC Fan

9.5.12.1 Removing the BUC Fan

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)

3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Press in and turn the elevation locking pin (only available from S/N TBD) to locked position.
5. Rotate the Polarisation Unit so that you can reach the BUC fan.
6. Disconnect the fan connector.
7. Remove the 2x4 mm Allen screws.

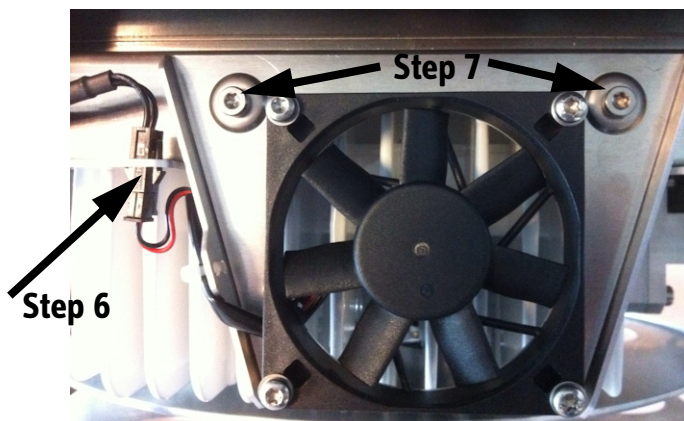


Figure 9-101: Removing the BUC fan

8. Remove the BUC fan.

9.5.12.2 Inserting a new BUC Fan

To insert a new BUC Fan follow the instructions above in reverse order.

9.5.13 Replacing the Block Up Converter (BUC)

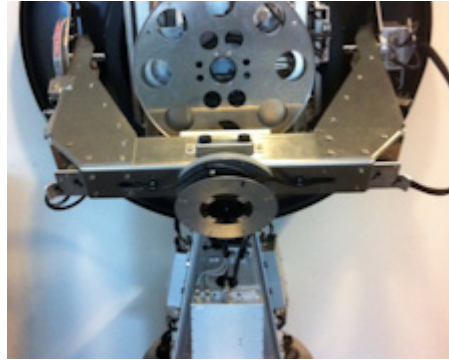


Figure 9-102: Block Up Converter (BUC), location

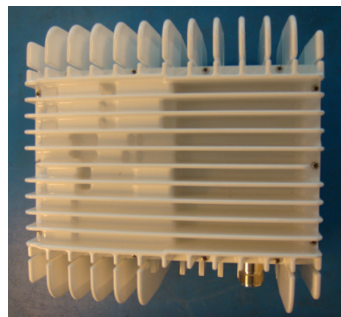


Figure 9-103: Block Up Converter (BUC)

The BUC converts the L-band IF (950 – 1700 MHz) up to Ku-band radio signal (13.75-14.50 GHz (extended)) and amplifies the TX power level. The BUC receives the TX signal and power from the VIM.

9.5.13.1 Removing the BUC

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)

1. Follow the instructions in *Removing the Polarisation Unit* on page 9-73.

2. Remove the 4x4 mm Allen screws from the waveguide flange at the side of the BUC.

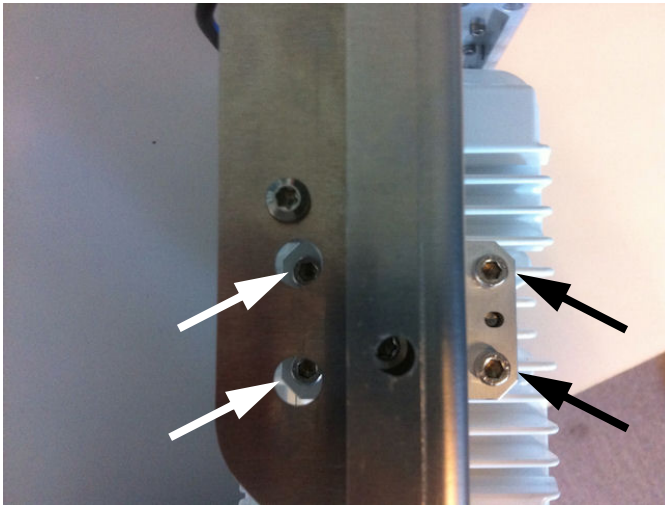


Figure 9-104: BUC, removing

3. Loosen the 2x4 mm Allen screws from the bracket at the side of the BUC.

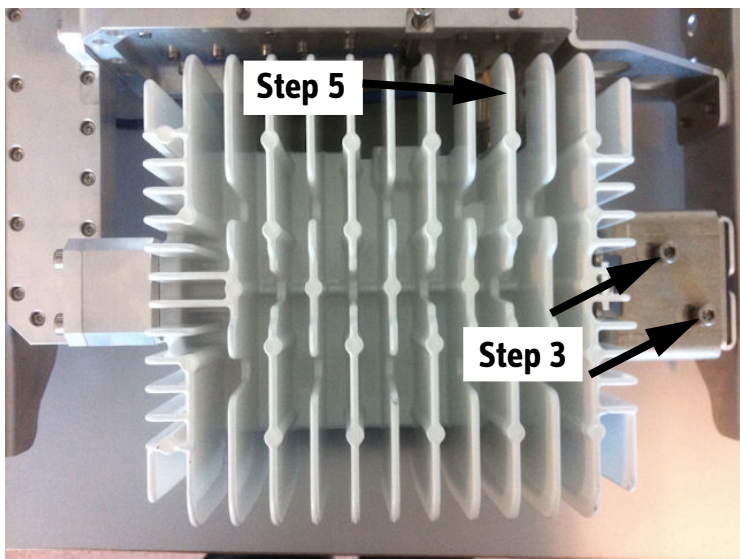


Figure 9-105: BUC, removing (continued)

4. Slide the BUC to the right to free it from the Polarisation Unit.
5. Disconnect the finger nut N-connector from the BUC.

9.5.13.2 Inserting a new BUC

To insert a new BUC follow the instructions above in reverse order.

9.5.14 Replacing the Low Noise Block down converter (LNB)



Figure 9-106: Low Noise Block (LNB)

The LNB down-converter receives the Ku-band radio signal (10.70-12.75 GHz), which will be amplified and converted down to a L-band IF (950 – 2150 MHz). The conversion is controlled by two or four LO's, locked to an external reference signal. The Ku-band interface is a WR75 waveguide and the IF interface is a 75 Ohm F connector. It has DC-power, 10 MHz external ref. Signal and a 22 KHz control signal is delivered via the IF cable. The L-band output is delivered to the VIM.

The removal and insertion procedures of the Co-pol LNB and the X-pol LNB are identical.

9.5.14.1 Removing the LNB

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Torx20 screw driver

1. Follow the instructions in *Removing the Polarisation Unit* on page 9-73.

2. Remove the 4x4 mm Allen screws that fix the LNB to the OMT.



Figure 9-107: LNB, removing

3. Remove the 4xTorx20 screws and separate the LNB from the filter. (Reuse the filter.)

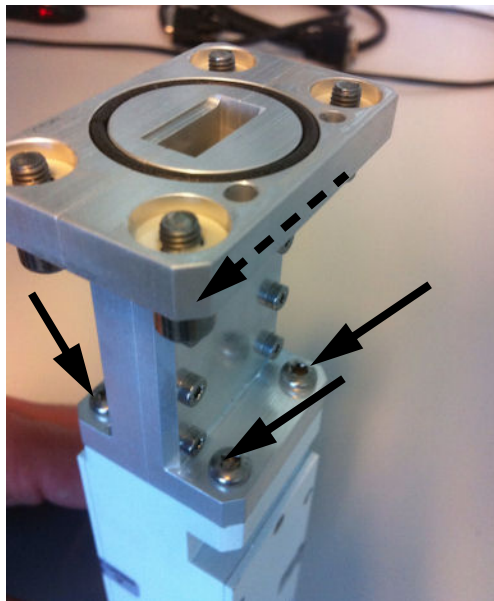


Figure 9-108: LNB, removing (continued)

9.5.14.2 Inserting a new LNB

To insert a new LNB follow the instructions above in reverse order.

9.5.15 Replacing the Ortho Mode Transducer (OMT)



Figure 9-109: Ortho Mode Transducer (OMT)

The OMT interfaces a low-loss waveguide from the dual-polarized feed-horn to the BUC/LNB.

The purpose of the OMT is to separate the TX and RX signals and provide isolation between BUC and LNB. DC power, 10 MHz external reference signal and a 22 kHz control signal is delivered via the IF cable. The OMT uses the independency of the signals to split and provide isolation. The OMT also detects the output power and temperature of the BUC.

9.5.15.1 Removing the OMT

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Torx20 screw driver

1. Follow the instructions in *Removing the Polarisation Unit* on page 9-73.
2. Follow the instruction in *Removing the LNB* on page 9-80 and remove both Co-pol LNB (to the left) and X-pol LNB (to the right).

3. Remove the 2xTorx20 screws on top of the OMT.

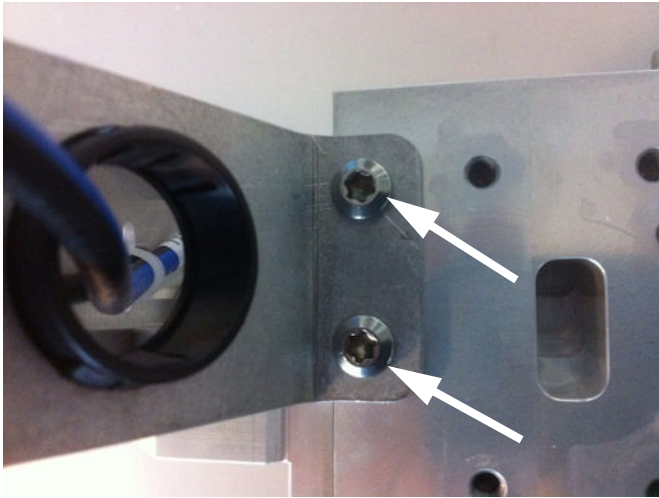


Figure 9-110: OMT, removing 2xTorx20 screws on top

4. Remove the 4xTorx 20 screws on the left-hand rail of the Polarisation Unit fixing the rail to the waveguide between the BUC and OMT.

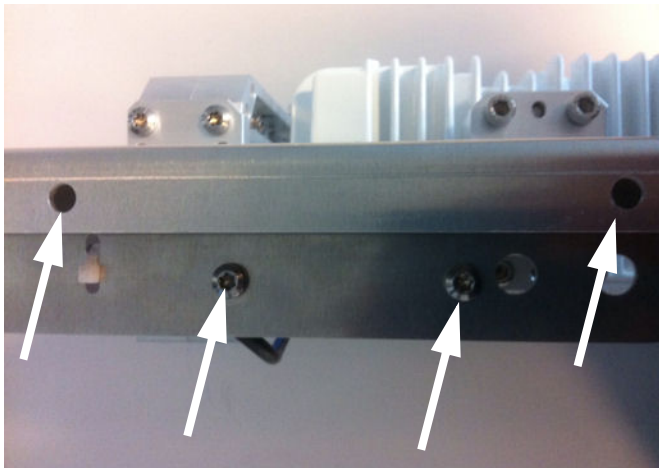


Figure 9-111: OMT, removing 4xTorx20 screws on the left-hand rail of the Polarisation Unit

5. Remove the 4xTorx 20 screws on the right-hand rail of the Polarisation Unit fixing the rail to the OMT.

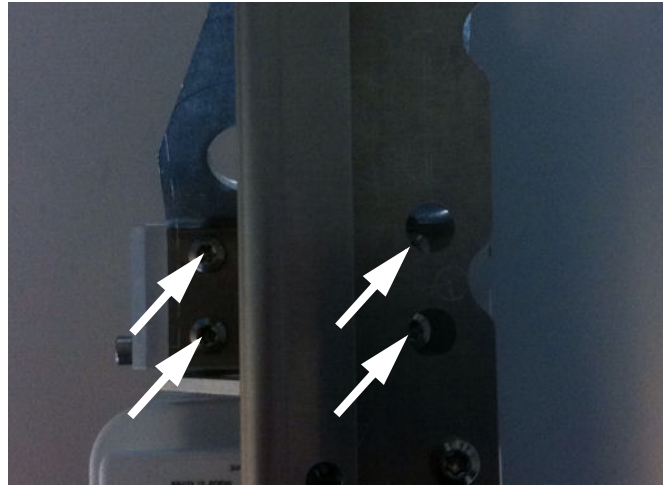


Figure 9-112: OMT, removing 4xTorx20 screws on the right-hand rail of the Polarisation Unit

6. Remove the 4x4 mm Allen screws from the waveguide flange at the side of the BUC.

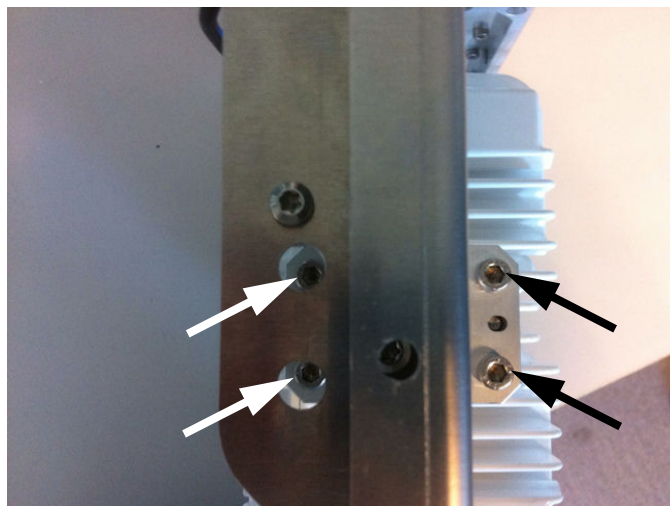


Figure 9-113: OMT, removing

7. The OMT and waveguide are now free to be removed from the Polarisation Unit.

8. Remove the 4xTorx 20 screws and remove the waveguide from the OMT.

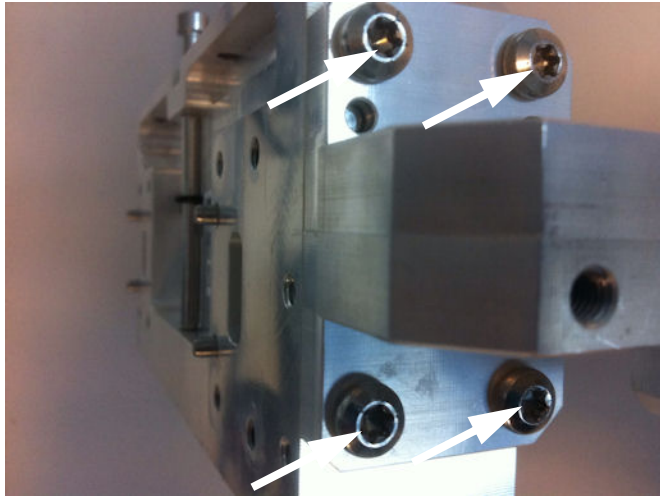


Figure 9-114: OMT, removing the waveguide

9.5.15.2 Inserting a new OMT

To insert a new OMT follow the instructions above in reverse order.

9.5.16 Replacing the rotary joint



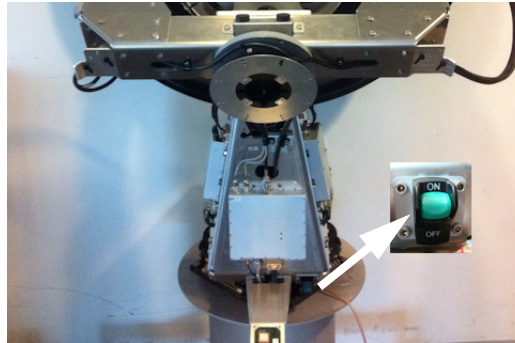
Figure 9-115: Rotary joint

9.5.16.1 Removing the rotary joint

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.



3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Rotate the Antenna Dish to top position.
5. Press in and turn the elevation locking pin (only available from serial number TBD) to locked position.
6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

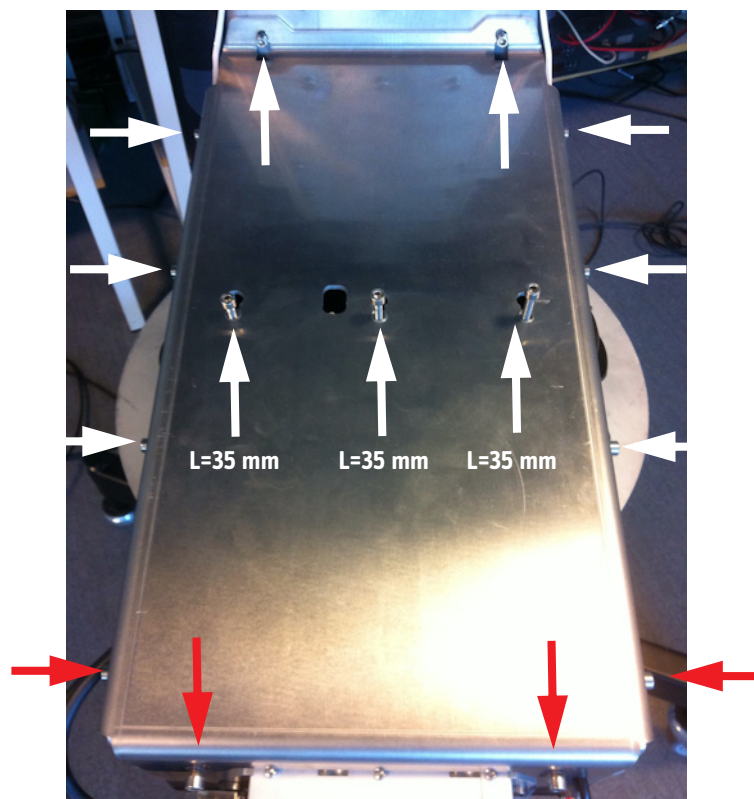


Figure 9-116: Azimuth motor, remove cover

7. Remove the RF connector (N-type, finger nut) from the Rotary Joint.

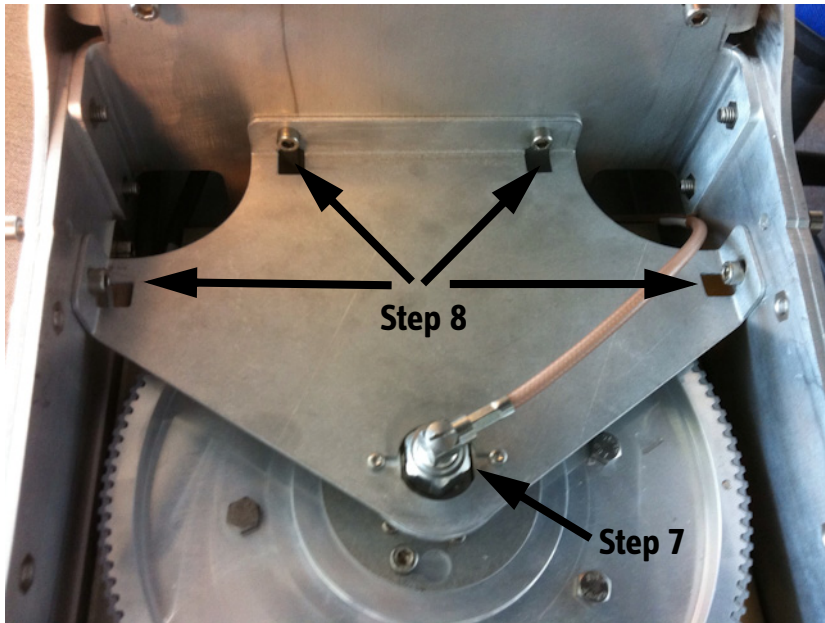


Figure 9-117: Getting access to the azimuth drive wheel

8. Loosen the 4x4 mm Allen screws from the cover plate over the azimuth drive wheel.
9. Remove the cover plate.
10. Loosen the 3x4 mm Allen screws.

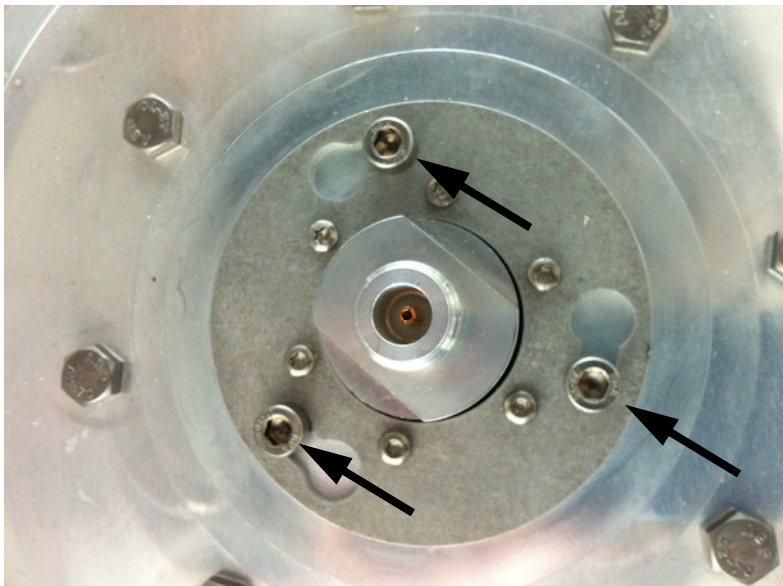


Figure 9-118: Rotary joint (in place)

11. Rotate the rotary joint on the key holes and lift it carefully up.

12. Disconnect the RF connector (N-type, finger nut) from the bottom end of the rotary joint.

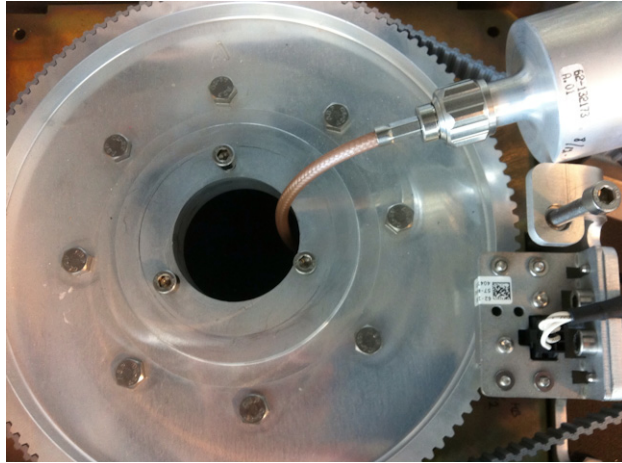


Figure 9-119: Rotary joint (removed)

13. Remove the rotary joint.

9.5.16.2 Insert a new Rotary Joint.

To insert a new Rotary Joint follow the instructions above in reverse order.

9.6 Updating VIM/PCM calibration data

After installing a new VIM (VSAT Interface Module) or PCM (Pedestal Control Module) you must update the calibration data.

The ACU does not know which of the two modules (PCM or VIM) has been replaced. The ACU needs to know which set of data to keep. You must select the **module that was not exchanged** so the calibration data can be copied to the module that was exchanged during service.

1. Enter the web interface (<http://192.168.0.1>) and click **SERVICE > XIM DATA**. A screen similar to the one in the figure below will appear:

XIM DATA	PCM	VIM
Antenna type	KU 100 cm	KU 100 cm
System type	VSAT	VSAT
Unit-no	Unit-Serial-Number	ADU-100-5
Status	Valid	Valid
	<input type="button" value="Select"/>	<input type="button" value="Select"/>

Warning! Selecting the wrong data will render the system useless. Please consult the manual before making any changes.

Figure 9-120: Updating VIM/PCM calibration data (example)

2. The figure shows at **Unit-no** Unit-Serial-Number for the PCM, because this module was exchanged during service. In this case the user must press the select button below the VIM module in order to copy the current calibration data to the new PCM module.

Important

Select always the XIM data for the module that was **not** exchanged.

3. Click **Select**, then a warning will appear.



Figure 9-121: XIM data, warning

4. Click **OK** to continue, the data is copied into the replaced module.



Figure 9-122: XIM data not ready

5. Click **Refresh**. When the XIM data has been successfully copied from one module to the other, the web interface displays a window showing the status of both modules as **Valid** (Select boxes are greyed out).

XIM DATA	PCM	VIM
Antenna type	KU 100 cm	KU 100 cm
System type	VSAT	VSAT
Unit-no	ADU-100-5	ADU-100-5
Status	Valid	Valid
	<input type="button" value="Select"/>	<input type="button" value="Select"/>

Figure 9-123: XIM data valid

The XIM data are now updated and the SAILOR 900 VSAT is operational again.

9.7 Troubleshooting

9.7.1 Overview

This section describes an initial check of the primary functions of the SAILOR 900 VSAT system, and provides some guidelines for troubleshooting, if one of the checks should fail.

Generally, if a fault occurs without any obvious reason, it is always recommended to observe the LEDs and the ACU display showing the active events. Possible failure states are shown in the web interface and the display of the ACU:

- SAFE MODE (e.g. hardware error, missing communication link between the ADU and ACU, excessive ship motion)
- XIM error (after exchange of modules)
- ADU POST error (hardware error)
- ACU POST error (hardware error)

For information on the function of the LEDs, see *Status signalling with LEDs and status messages* on page 9-8.

For a list of all the error messages and warnings, see *Event messages – overview* on page G-1.

9.7.2 Event list for troubleshooting

You can use the event list for troubleshooting. It is described in detail at *Help desk and diagnostic report* on page 9-2.

You can download the event list as part of a diagnostic report.

9.7.3 Diagnostic report for troubleshooting

You can generate a diagnostic report containing results from the POST, all events and system log information since the last reset to factory default. For more information see *Sending a diagnostics report* on page 6-36.

9.7.4 Troubleshooting – BUC

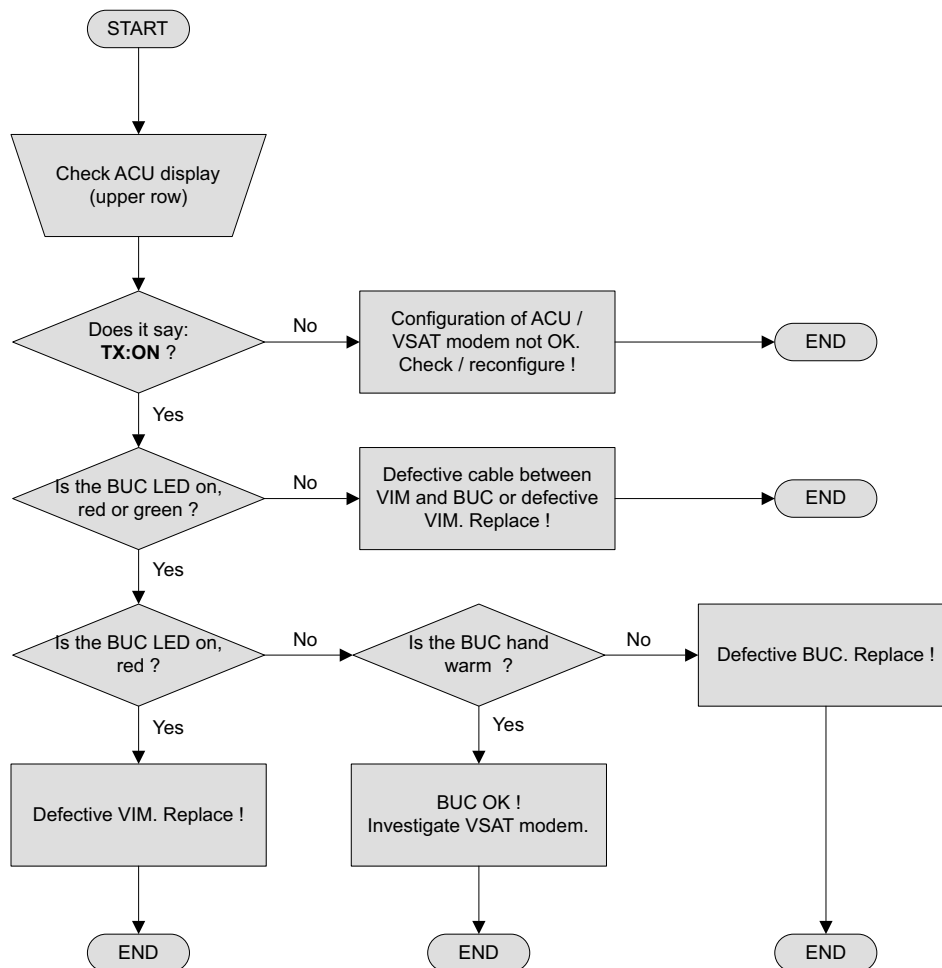


Figure 9-124: Troubleshooting – BUC

9.7.5 Troubleshooting – LNB

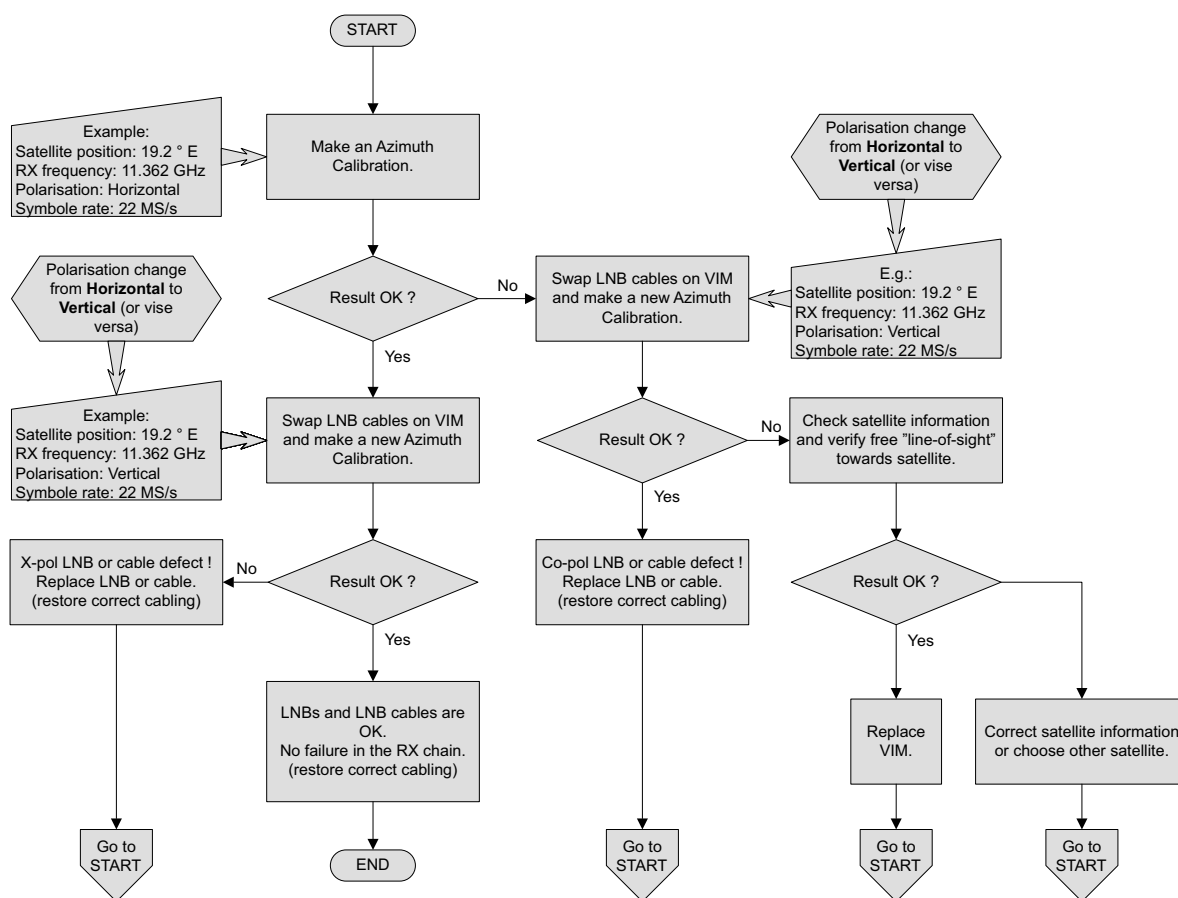
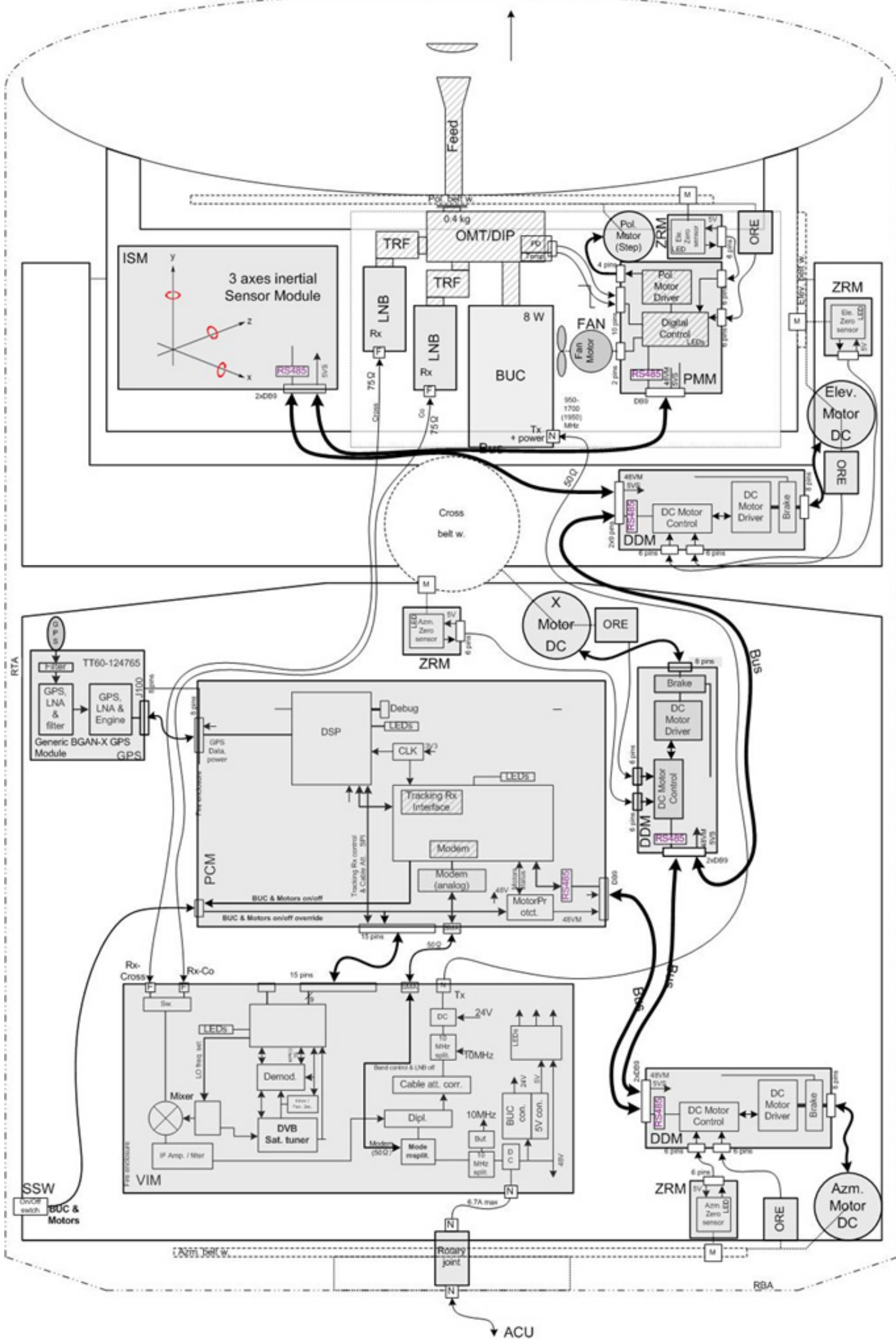


Figure 9-125: Troubleshooting – LNB

9.7.6 System block diagram (ADU)

On the next page you find the system block diagram of the ADU.



Appendices

Technical specifications

A.1 SAILOR 900 VSAT system components

A.1.1 General specifications

Item	Specification
Frequency band	Ku-band (VSAT)
Rx	10.70 to 12.75 GHz
Tx	13.75 to 14.50 GHz (extended)
Reflector size	103 cm (40 inch)
Certification (approval)	Compliant with CE (Maritime), ETSI EN 302 340, CEI/IEC 60950-1, CEI/IEC 60945, CEI/IEC 60950-22
ADU cable type (ACU to ADU)	Single 50 Ohm coax cable for Rx, Tx, ACU-ADU modem and power
ADU cable connector at the ADU	Female N-Connector (50 Ohm)
ADU cable connector at the ACU	Female N-Connector (50 Ohm)
System power supply range	20–32 VDC (Start up voltage: 22 VDC guaranteed)
Total system power consumption	370 W peak, 175 W typical (up to 8 W BUC)

Table A-1: General specifications

A.1.2 ADU

Item	Specification
Dimensions (overall)	Diameter x Height: Ø 130 cm (51.3 inch) x H 150 cm (58.9 inch)
Weight	135 kg (288 lbs)
Antenna type, pedestal	3-axis (plus skew) stabilised tracking ADU with integrated GPS
Antenna type, reflector system	Reflector/sub-reflector, ring focus
Transmit Gain	41.4 dBi typ. @ 14.25 GHz (excluding radome)
Receive Gain	40.1 dBi typ. @ 11.70 GHz (excluding radome)
System G/T	17.9 dB/K typ. @ 11.70 GHz, at $\geq 30^\circ$ elevation and clear sky (including radome)
BUC output power	8 W
EIRP	≥ 49 dBW (including radome)
LNB	2 units 4-band LNBs (band selection by ACU)
Tracking Receiver	Internal "all band/modulation type" and VSAT modem RSSI
Polarisation	Linear Cross or Co-Pol (selected by ACU)
Elevation Range	-25° to $+125^\circ$
Azimuth Range	Unlimited (Rotary Joint)
Ship motion, angular	Roll $\pm 30^\circ$, Pitch $\pm 15^\circ$, Yaw $\pm 10^\circ$
Ship, turning rate and acceleration	$15^\circ/\text{s}$ and $15^\circ/\text{s}^2$
ADU motion, linear	Linear accelerations ± 2.5 g max any direction

Table A-2: Technical specifications for the Above Deck Unit

Item	Specification
Satellite acquisition	Automatic - w. Gyro/GPS compass input
Vibration, operational	Sine: IEC 945 (8.7.2), DNV A, MIL-STD-167-1 (5.1.3.3.5). Random: Maritime
Vibration, survival	Sine: IEC 945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. Random: Maritime survival
Shock	MIL-STD-810F 516.5 (Proc. II)
Temperature (ambient)	Operational: -25° C to 55° C Storage: -40°C to 85°C
Humidity	100%, condensing
Rain (IP class)	IEC 945 Exposed (IPX6)
Wind resistance	Operational: 80 kt. Survival: 110 kt.
Ice	Survival: 25 mm (1 inch)
Solar radiation	1120 W/m ² to MIL-STD-810F 505.4
Compass safe distance	1 m to IEC 945
Maintenance, scheduled	None
Maintenance, unscheduled	All electronic, electromechanical modules and belts can be replaced through the service hatch.
Built-in tests	Power On Self Test (POST) Person Activated Self Test (PAST) Continuous Monitoring (CM) with error log
Power OFF	Automatic safe mode
Input power	Powered by ACU

Table A-2: Technical specifications for the Above Deck Unit (Continued)

A.1.3 ACU

Item	Specification
Dimensions, rack mount	1 U, 19 inch
H x W x D	4.4 x 48 x 33 cm (1.75 x 19 x 13 inch)
Dimensions, bulkhead mount	stand-alone unit
H x W x D	4.3 x 25.5 x 27.8 cm (1.67 x 10.0 x 10.9 inch)
Weight, rack mount	4.5 kg (10 lbs)
Weight, bulkhead mount	2.7 kg (6 lbs)
Ambient temperature	Operational: -25°C to +55°C Storage: -40°C to +85°C
Humidity	IEC 945 protected, 95% (non-condensing)
IP class	IP31
Compass safe distance	1 m to IEC 945
Interfaces	1 x N-Connector for antenna RF Cable (50 Ohm) w. automatic cable loss compensation 2 x F-Connectors (75 Ohm) for Rx/Tx to VSAT modem 4 x Ethernet 1 x RS-422 data (VSAT modem control) 1 x RS-232 data (VSAT modem control) 1 x NMEA 2000 (CAN bus) and NMEA 0183 (RS-422) for Gyro/GPS compass input 1 x DC power input 1 x Grounding bolt
Input power	See <i>System power supply range</i> and <i>Total system power consumption</i> on page A-1.
Modem interface (control)	iDirect openAMIP protocol & custom protocol

Table A-3: Technical specifications for the ACU

Item	Specification
Man Machine Interface (MMI)	OLED (red) display, 5 push buttons, 3 discrete indicator LEDs and ON/OFF switch
No transmit zones	Programmable

Table A-3: Technical specifications for the ACU (Continued)

A.1.4 Supported VSAT modems

Item	Specification
VSAT modems supported	iDirect iNFINITI (Serial) iDirect iNFINITI (OpenAMIP) iDirect Evolution (Serial) iDirect Evolution (OpenAMIP) COMTECH CDM 570L COMTECH CDM 625L COMTECH 570L and ROSS STM SatLink 2900 Gilat SkyEdge II For a list of supported VSAT modems see also the SAILOR 900 VSAT data sheet.

Table A-4: Supported VSAT modems

A.2.2 ACU, bulkhead

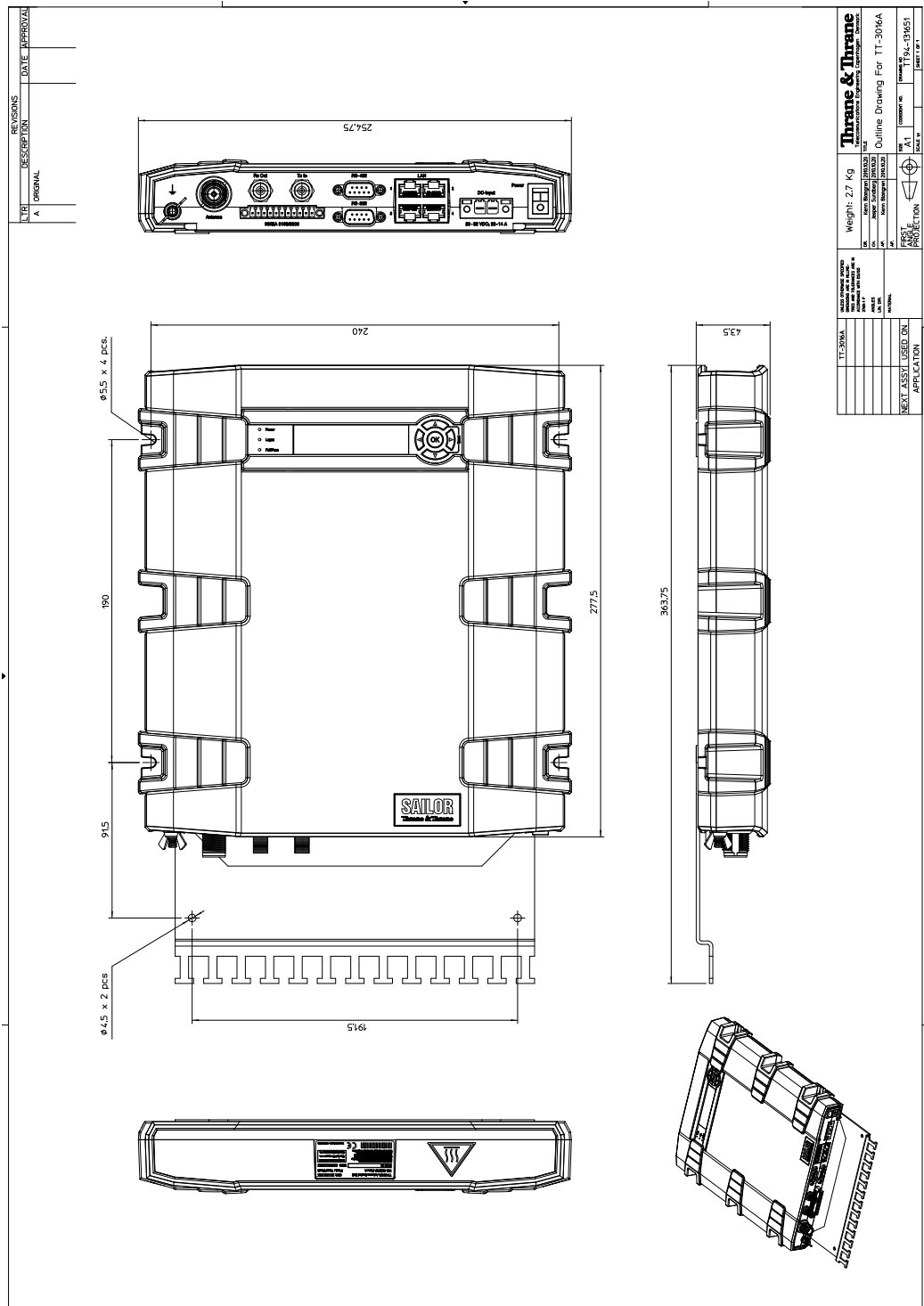


Figure A-2: Outline drawing: ACU, bulkhead

A.2.3 ACU, 19 inch rack

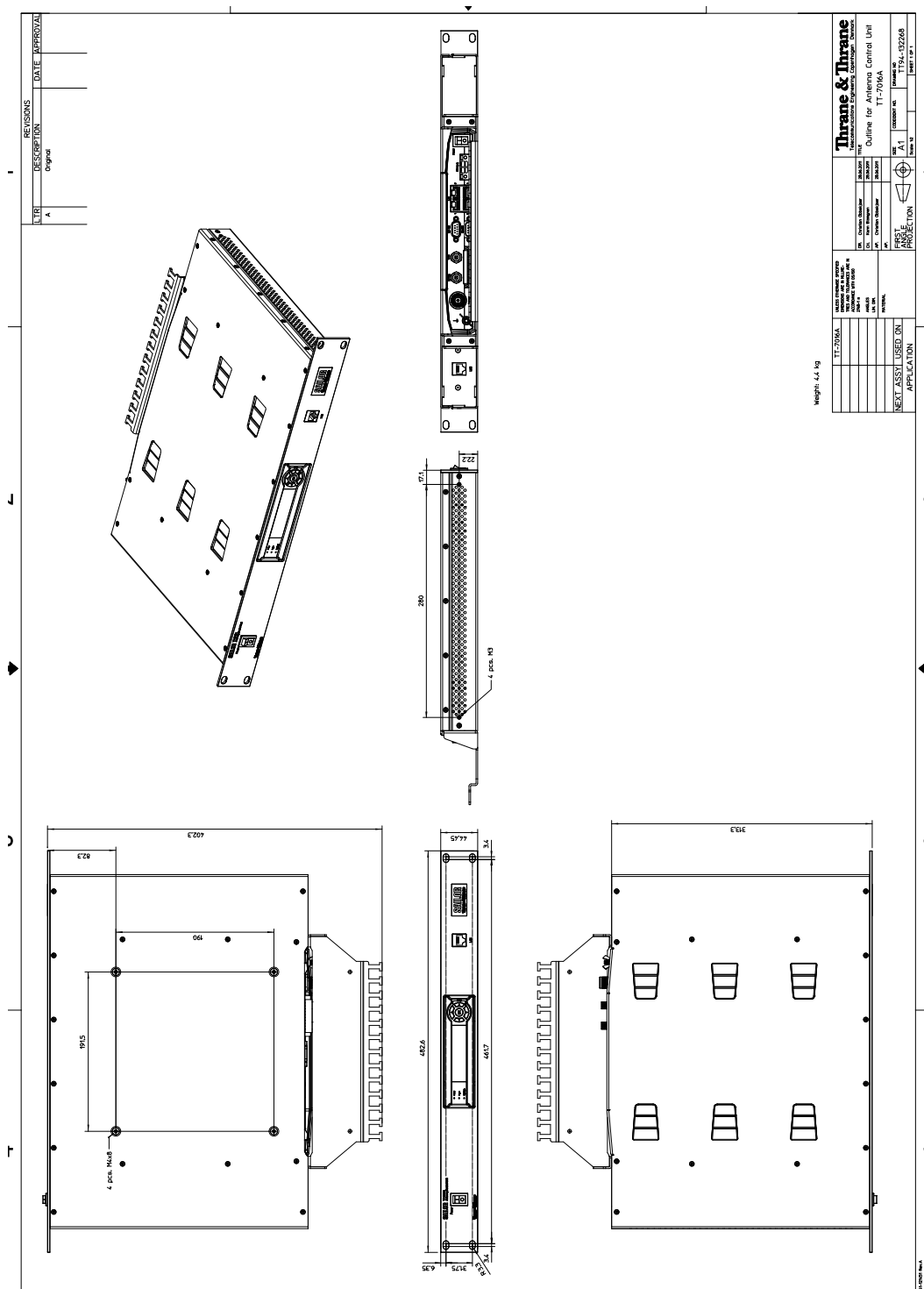
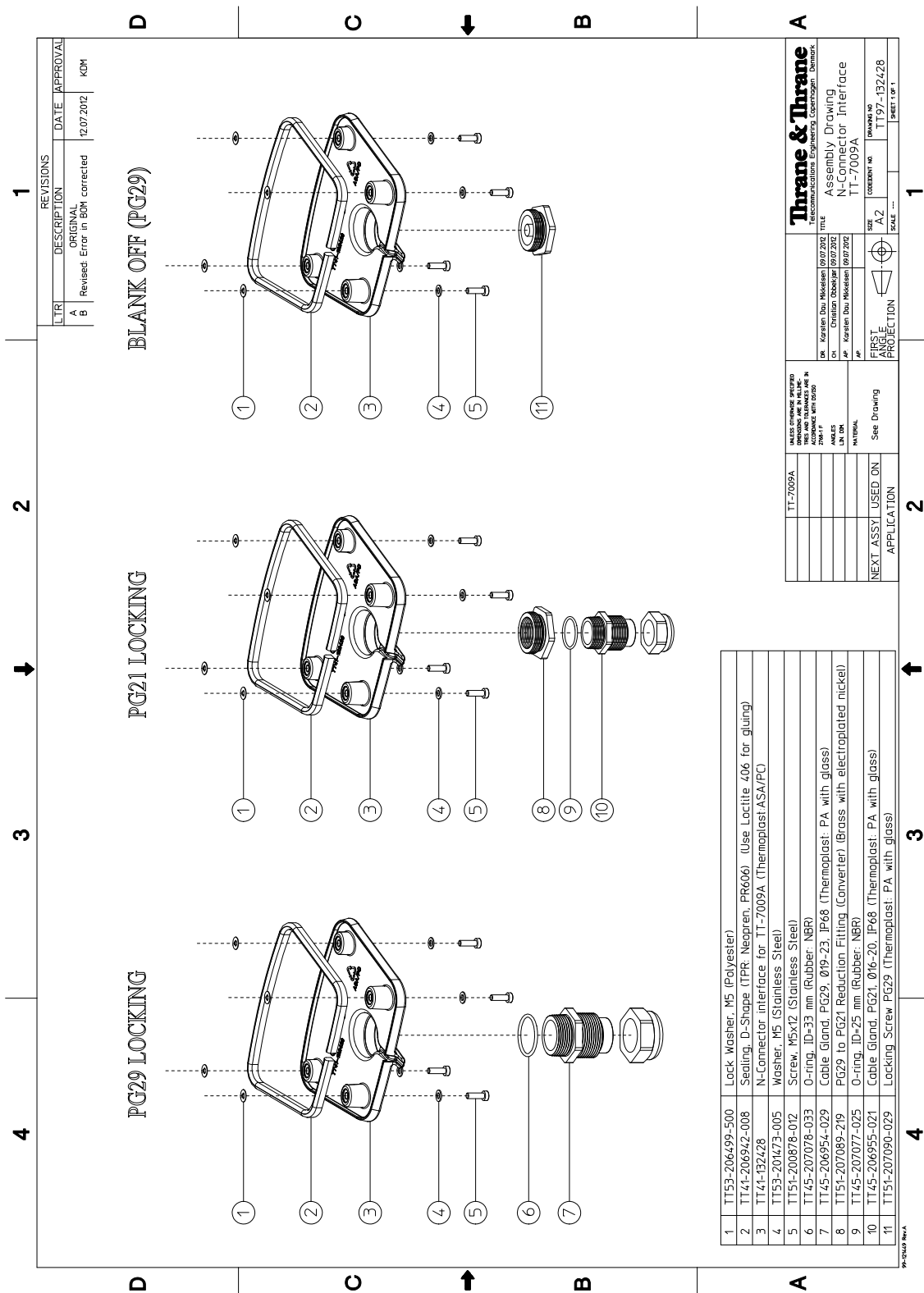


Figure A-3: Outline drawing: ACU, 19 inch rack

Figure A-4: N-Connector interface on the ADU



A.3 VSAT LNB Data Sheet (physical LNB)

The following table shows the data of the LNBs which are fitted in the ADU.

The SAILOR 900 VSAT is designed to make any Ku Band frequency in the range of 10.7 GHz to 12.75 GHz available to a VSAT modem by allowing the user to select the LNB LO of his choice – without having to exchange the physical LNBs in the ADU. This is achieved by the sophisticated single-cable solution of the SAILOR 900 VSAT.

Please see A.3.1 for configuration information.

Interface	Model	Spec.				
Input, Ku-band	2-band	WR75 waveguide				
Output, IF	2-band	F (75 Ω)				
LO type	2-band	Locked to 10 MHz external reference over IF interface or ACU internal				
LO frequencies	2-band	9.75, 10.75 GHz				
Parameter		Condition/remark	Unit	Min	Typ	Max
Input frequency range		VSAT	GHz	10.7		12,75
Output (IF) frequency range		2-band	MHz	950		2150
VSWR		Input	-			2.0 : 1
		Output	-			1.7 : 1
Noise Figure		At 25 °C	dB		0,8	
Gain			dB		60	
Gain (relative)		Over 500 MHz BW	dB	-2.0	0	2.0
Gain (relative)		Over 36 MHz BW	dB	-0.5	0	0.5
External ref. freq. (input)		Nominal	MHz		10	
Power supply voltage		DC	V	11.0		19.0
Supply current		DC	mA			350
LO selection voltage		Voltage, low (L) (input)	V	11.0		14.0
		Voltage, high (H) (input)	V	16.0		19.0
Temperature range (ambient)		Operation	°C	-30		75
		Storage	°C	-40		85
Dimensions (incl. connector)		L	mm			140
over all		W	mm			58
		H	mm			50
Weight		Total	g			350

Table A-5: Technical specifications for VSAT LNB

A.3.1 VSAT LNB user installation and configuration information

The SAILOR 900 VSAT can interpret 4-band LNB switching signals as well as exact LO information acquired directly from the attached VSAT modem by means of a data connection.

When using a VSAT modem which is integrated to use LO information transferred via a data connection, the LO must be in the range of 9.6 GHz to 11.3 GHz (Optimum values are 9.75 GHz and 10.75 GHz as these match the physical LNB values).

All VSAT modems that can be used with SAILOR 900 VSAT use this approach for selecting the LO frequency, except a COMTECH modem with ROSS server. A COMTECH modem with ROSS server reads switching signals by means of a data connection instead of using voltage and tone signals.

A.3.1.1 Example configuration for an iDirect i5100 (L-Band range 950 - 1700 MHz)

KuBand frequency:	11.7389 GHz
L-Band frequency:	1638.9 MHz
LO:	10.1 GHz

Since the LO frequency of 10.1 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR 900 VSAT will tune to 11.7389 GHz and provide the carrier on the L-Band frequency 1638.9 MHz.

A.3.1.2 Example configuration for a special VSAT modem (L-Band range 950 - 1450 MHz)

KuBand frequency:	12.750 GHz
L-Band frequency:	1450 MHz
LO:	11.3 GHz

Since the LO frequency of 11.3 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR 900 VSAT will tune to 12.750 GHz and provide the carrier on the L-Band frequency 1450 MHz.

A.3.1.3 4-band switching

When using 4-band switching and a VSAT modem which is integrated with SAILOR 900 VSAT to use voltage and tone for switching, the switching is done according to the following table:

LO frequency	Voltage 11–19 V	Tone 22 kHz	Ku band frequency (L-band 950–2150 MHz)
9.75 GHz	11–14 V	Tone off	10.7–11.9 GHz
10.25 GHz	11–14 V	Tone on	11.2–12.4 GHz
10.75 GHz	16–19 V	Tone off	11.7–12.75 GHz
11.25 GHz	16–19 V	Tone on	12.2–12.75 GHz

Table A-6: 4-band switching

Currently none of the VSAT modems which are integrated with the SAILOR 900 VSAT use voltage and tone switching.

A.4 VSAT 8 W BUC Data Sheet (Extended)

Interface	Model	Spec.			
Input, IF	-	N (50 Ω)			
Output, Ku-band	8 W	WR75 waveguide (39.0 dBm min.)			
Spectrum	-	Non inverting			
LO type	-	Locked to 10 MHz external reference over IF interface or ACU internal			
LO frequency	Extended	12.80 GHz			
TX ON/OFF	-	10 MHz reference ON/OFF			
Cooling	-	External temperature controlled fan - not incl. BUC			
Parameter	Condition/remark	Unit	Min	Typ	Max
Output frequency range	VSAT Ext. TX	GHz	13.75		14.50
Input (IF) frequency range	Extended	MHz	950		1700
VSWR	Input (10, 950 - 1700 MHz)	-			2.0 : 1
	Output (13.75 - 14.50 GHz)	-			2.0 : 1
Output power at P1dB	Worst case	dBm	39.0		
Output power 10 MHz ref OFF	TX band, at -35 dBm ref.	dBm			-60
Gain (absolute linear)	Over output freq. range	dB	61	65	69
Gain (relative)	Over 500 MHz BW	dB	-2.5	0,0	2.5
Gain (relative)	Over 36 MHz BW	dB	-1.0	0,0	1.0
Spurious	RX band	dBc			-60
	TX band	dBc			-15
Phase noise	10 Hz	dBc/Hz			-50
	100 Hz	dBc/Hz			-60
	1 kHz	dBc/Hz			-70
	10 kHz	dBc/Hz			-80
	100 kHz	dBc/Hz			-90
	1 MHz	dBc/Hz			-110
IMD3	At 2 x +33 dBm carriers	dBc			-26
External ref. freq. (input)	Nominal	MHz		10,000000	
External reference freq. (input)	Deviation	Hz	-100	0	100
Power supply voltage	DC	V	20.0		50.0
Supply power	DC	W			85
Temperature range	Operation w. external				
	forced cooling	°C	-30		75
	Storage	°C	-40		85
Dimensions	L	mm			176
	W	mm			170
	H	mm			102
Weight	Total	g			2700

Table A-7: Technical specifications for VSAT 8 W BUC

VMU cable specifications

This appendix contains cable specifications for cables between the ACU and a VSAT modem.

- *Modem Cable Comtech Serial & RSSI TT7016A*
- *Modem Cable iNIFINITI iDirect VSAT modem*

B.1 Modem Cable Comtech Serial & RSSI TT7016A

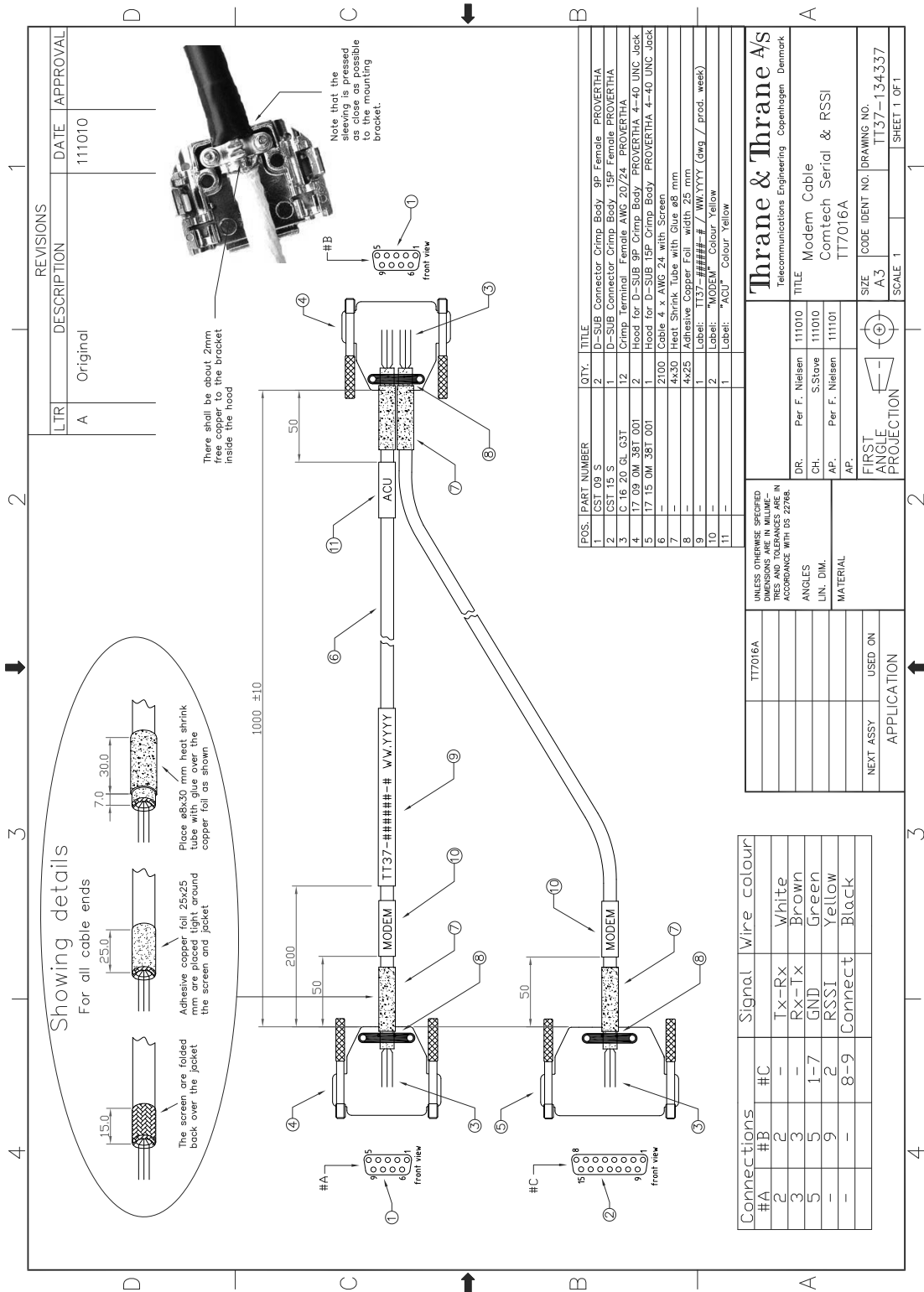


Figure B-1: Modem Cable Comtech Serial & RSSI TT7016A

B.2 Modem Cable iNIFINITI iDirect VSAT modem

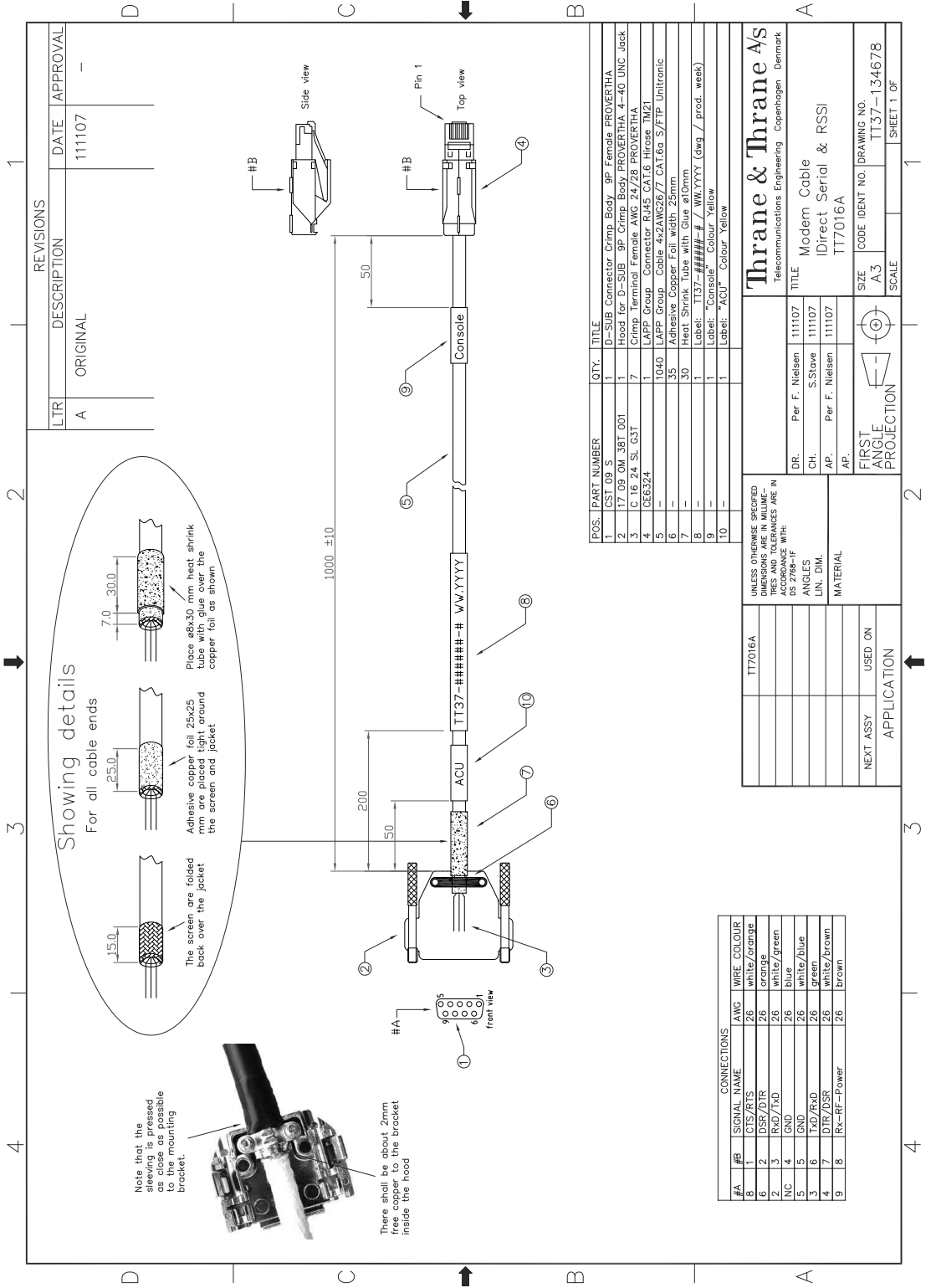


Figure B-2: Modem Cable iNIFINITI iDirect VSAT modem

VMU settings requirements

In this appendix you find detailed information how to set up supported VSAT modems. The following VSAT modems are described:

- *Open AMIP setup for iDirect INFINITI & Evolution*
- *Non-Open-AMIP setup for iDirect iNFINITI 5000 & Evolution X5*
- *Comtech 570L, ROSS box & ACU*
- *STM SatLink 2900 VSAT modem*
- *Gilat SkyEdge II VSAT modem*

C.1 Open AMIP setup for iDirect INFINITI & Evolution

C.1.1 Protocol and interfaces

C.1.1.1 Introduction

The following sections describe the protocol and interface between the SAILOR 900 VSAT ACU and an iDirect OpenAMIP VSAT modem. OpenAMIP operation is normally used by service providers offering global VSAT service as the protocol supports roaming between satellites (Automatic Beam Switching).

OpenAMIP, an ASCII message based protocol invented and Trademarked by iDirect is a specification for the interchange of information between an antenna controller (ACU) and a VSAT modem (VMU). This protocol allows the VSAT modem to command the ACU to search and lock to a particular satellite as well as allowing exchange of information necessary to permit the VSAT modem to initiate and maintain communication via the antenna and the satellite. In general, OpenAMIP is not intended for any purpose except to permit a modem and the ACU to perform synchronized automatic beam switching.

Thrane & Thrane A/S received OpenAMIP certification for SAILOR 900 VSAT from VT iDirect Inc on 22 September 2011.

C.1.1.2 Connections

Connect the ACU and iDirect modem with the following cables:

- Ethernet cable for TCP/IP data communication
- RS-232 console cable for signal strength indication (part number: 407090A-020)
- 75 Ohm RF cables F-F connectors for rx and tx frequencies.

See *Connecting an iNFINITI® Series Satellite Router* on page 4-9 and *Connecting an Evolution® Satellite Router* on page 4-10 for

details on cable connections and pin allocation for the RS-232 Console cable.

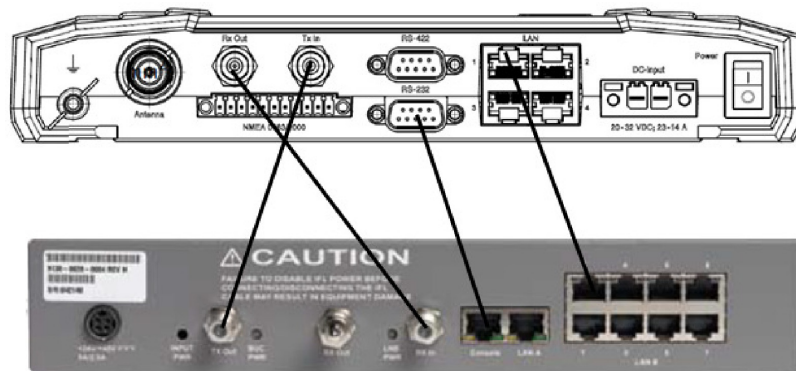


Figure C-1: Connecting iDirect INFINITI 5000 series to the ACU (OpenAMIP)

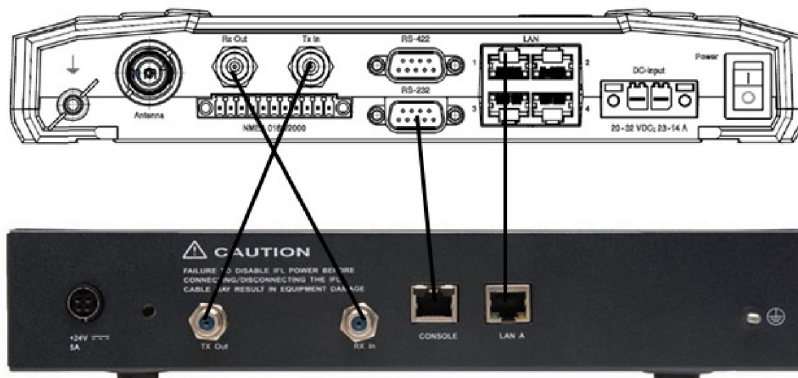


Figure C-2: Connecting iDirect Evolution X5 to the ACU (OpenAMIP)

C.1.1.3 Protocol

The SAILOR 900 VSAT ACU supports all OpenAMIP commands except the X command which is optional. All the supported OpenAMIP commands are shown in the following figure.

iDS/iDX Release	Messages Sent from Remote		Options File Group	Messages Sent from Antenna	
	Message	# Parameters		Message	# Parameters
iDX 2.0.x	A		keepalive_interval Default value of 15 seconds. Will not appear in Options file unless overwritten.	[ANTENNA] a	
	B	2	rx_lcl_osc, tx_lcl_osc	[SATELLITE]	
	H	2	hunt_frequency, hunt_bandwidth	[SATELLITE]	
	K	1	max_skew Maximum skew of the beam short axis to the geosynchronous arc.	[SATELLITE]	
	P	2	polarity, tx_polarity	[SATELLITE]	
	S	3	longitude, max_lat, pol_skew	[SATELLITE] s	2
	T	2	tx_frequency, tx_bandwidth	[SATELLITE]	
	W	1	latlong_interval Message contains single value in seconds. Does not generate Options file key.	[MOBILE] w	4

Figure C-3: Supported OpenAMIP commands

Messages sent from VSAT modem	Explanation
S -15.000000 0.000000 0.000000	Longitude, Max_lat, Pol_skew
H 1451.815000 1.905000	Hunt_frequency, Hunt_bandwidth
P H V	Rx_polarity, Tx_polarity
B 11250.000000 12800.00000	Rx-lcl_osc, Tx_lcl_osc
T 1403.290000 0.618000	Tx_frequency, Tx_bandwidth
A 15	Keepalive_interval in mS [ACU: s message]
W 300	latlong_interval in seconds [ACU: w message]
L 1 1	Modem locked
K 90.000000	Max_skew

Table C-1: Messages sent from the VSAT modem to the ACU (examples)

Messages sent from the ACU to the VSAT modem	Explanation
s 11	Functional, Tx OK
w 1 55.794010 12.52272 985523005	GPS valid, Latitude, Longitude, Time

Table C-2: Messages sent from the ACU to the VSAT modem (examples)

Note

The iDirect modems only send the satellite information once when booting. If the ACU has not received the information for some reason, the system cannot point. In that case the modem will automatically boot after 5 minutes and send the satellite information again.

The signal strength from the modem is measured on RS-232 pin 9. It is a DC voltage in the range of 0 - 5 VDC.

Ranges for signal strength	
VDC	Antenna status
0-2.5	RF energy is detected, but from the wrong satellite.
2.6-5.0	Carrier lock, correct satellite.

Table C-3: Ranges for signal strength for iDirect Open AMIP VSAT modem

The signal strength displayed web interface on the Dashboard as 0 - 500. The minimum value for an Internet connection is 250 - 260.

C.1.2 Sample options file

The following section presents a portion of a sample iDX 2.0.x Options file with OpenAMIP messages and parameters defined. OpenAMIP keys appear highlighted in bold.

```
[OPTIONS_FILE]
product_mode = idirect_scpc
modem_sn = 40170
generated_by = NMS-10.0.0
did = 12885226
modem_type = Remote
modem_hardware = 5000
is_mesh = 0
disable_options_flash_command = 0
carrier_type = 0
```

```
...
[MOBILE]
is_mobile = 1
tx_handshake_enabled = 0
gps_input = 2
latlong_interval = 300
latlong_fail_interval = 10
init_tx_power_offset = 0.000000
[MAPSERVER_0]
hostname = 172.20.130.3
port = 5003
[BEAMS]
beam_21 = PPS_Perf_Eval
maxbeam = 21
[ANTENNA]
manufacturer = OpenAMIP
model = OpenAMIP
addr = 172.26.81.34
port = 2000
connect_timeout = 30
dedicated_interface = ixp1
[SATELLITE]
min_look_angle = 0.000000
tx_frequency = 1300.000000
tx_bandwidth = 36.000000
hunt_bandwidth = 36.000000
rx_lcl_osc = 11250.000000
tx_lcl_osc = 12800.000000
max_skew = 90.000000
name = T12
channelname = T12_EMEA
longitude = -15.000000
max_lat = 0.000000
pol_skew = 0.000000
hunt_frequency = 1075.000000
polarity = H
tx_polarity = X
noise_reference_frequency = 0.000000
```

The option file must use following information:

Section in the option file	Requirements
[SATELLITE]	<p>The modem provides RX and TX frequency information via a data connection to the SAILOR 900 VSAT.</p> <p>The single-cable solution makes it possible to configure the VSAT modem to use any LO frequency in the range from 9.6 GHz to 11.3 GHz. The SAILOR 900 VSAT will tune to the correct Ku-Band frequency and provide the correct L-Band frequency to the VSAT modem.</p> <p>Example: “rx_lcl_osc = 11250.000000”</p> <p>SAILOR 900 has an extended 8 Watt BUC with LO up conversion frequency of 12.8 GHz.</p> <p>– Example: “tx_lcl_osc = 12800.000000”</p> <p>Note: SAILOR 900 VSAT supports any LNB frequency due to the 1-cable design.</p>
[MOBILE]	<p>The iDirect modem must be set to mobile unit and receive the GPS information from the ACU with the command “w <Valid> <Lat> <Lon> <Time>”.</p> <p>Example: “is_mobile = 1”</p> <p>Tx handshake must not be enabled in the iDirect modem.</p> <p>Example: “tx_handshake_enabled = 0”</p>
[ODU]	<p>The SAILOR 900 VSAT can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem. See also <i>VSAT modem profile – New entry and Edit</i> on page 6-24.</p> <p>Example: “odu_rx_10_mhz = 1”</p> <p>The SAILOR 900 VSAT needs the Tx 10 MHz reference signal in order to allow TX ON.</p> <p>Example: “odu_tx_10_mhz = 1”</p>

Table C-4: Information in the VSAT modem option file

C.1.3 Configuration examples (OpenAMIP)

Examples of modem profile and satellite configuration from the ACU web MMI are shown in the figures below.

The screenshot shows the 'EDIT VSAT MODEM PROFILE' configuration page. It contains the following fields and values:

Field	Value
Profile name	5000 iDirect OpenAMIP
VSAT modem	iDirect INFINITI 5000 Series (OpenAMIP)
This modem profile is used on	1 satellite profile
VSAT modem root password	
VSAT modem user password	
OpenAMIP IP address	10.224.10.82
OpenAMIP port	2000

At the bottom, there are 'Apply' and 'Cancel' buttons.

Figure C-4: VSAT modem profile, OpenAMIP (example)

The screenshot shows the 'EDIT SATELLITE PROFILE' configuration page. It contains the following fields and values:

Field	Value
Satellite profile name	HM-OpenAMIP
VSAT modem profile	5000 iDirect OpenAMIP

Below these fields are 'Apply' and 'Cancel' buttons. The page is divided into two sections by a horizontal line. The top section is titled 'Tracking' and contains the following options:

- ☒ VSAT modem (selected)
- ☐ User defined

Below these are input fields for:

- RX frequency: 0 GHz
- DVB-S / DVB-S2: ☐ (selected)
- Symbol rate: 0 MS/s
- NID: 0
- DVB power: ☐ (selected)
- Narrow band: ☐ (selected)
- VSAT modem RSSI: ☐ (selected)

At the bottom of the second section are 'Apply' and 'Cancel' buttons.

Figure C-5: Satellite profile, OpenAMIP (example)

Simple OpenAMIP protocol in iDS 8.0.2.7 is **NOT** supported by the SAILOR 900 VSAT.

Full OpenAMIP protocol from iDX 2.0 and up is supported by the SAILOR 900 VSAT.

C.2 Non-Open-AMIP setup for iDirect iNFINITI 5000 & Evolution X5

C.2.1 Protocol and interfaces

C.2.1.1 Introduction

The following sections describe the protocol and interface between the ACU and an iDirect Non-OpenAMIP modem. Non-OpenAMIP operation is normally used by service providers offering regional VSAT service.

C.2.1.2 Connections

Connect the ACU and iDirect modem with the following cables:

- RS-232 console cable for control communication
- 75 Ohm RF cables F-F connectors for rx and tx frequencies.

See *Connecting an iNFINITI® Series Satellite Router* on page 4-9 and *Connecting an Evolution® Satellite Router* on page 4-10 for details on cable connections.

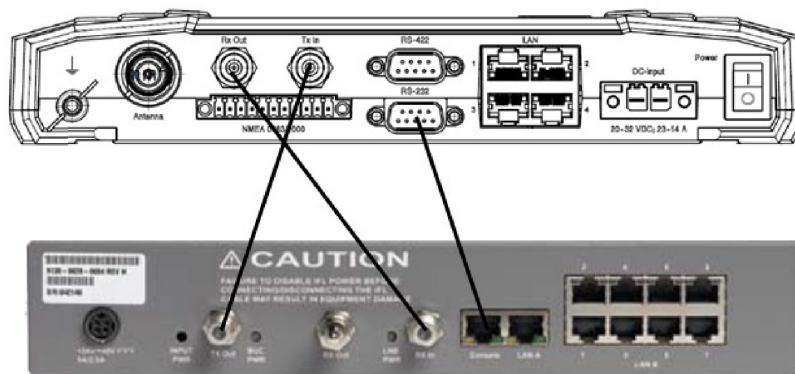


Figure C-6: Connecting iDirect iNFINITI 5000 series to the ACU (Non-OpenAMIP)

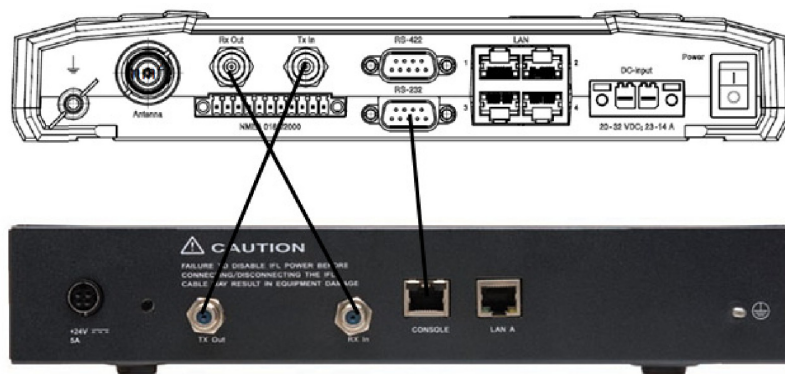


Figure C-7: Connecting iDirect Evolution X5 to the ACU (Non-OpenAMIP)

The pin allocation for the RS-232 Console cable is shown below. See also Appendix B on page C-1 for a cable drawing.

Console Port(DTE)	RJ-45 Pin	Color Code	RJ-45 to DB-9 Adapter Pin	Console Device
RTS	1	Blue	8	CTS
DTR	2	Orange	6	DSR
TxD	3	Black	2	RxD
GND	4	Red	NC	GND
GND	5	Green	5	GND
RxD	6	Yellow	3	TxD
DSR	7	Brown	4	DTR
Rx-RF-Power	8	White/Grey	9	--

Figure C-8: RS-232 Console cable for iDirect Non-OpenAMIP VSAT modem

C.2.2 Console port settings

The iDirect modem must be configured to use following console port settings:

- Baud rate: 4800 or 9600
- Data bits: 8
- Parity: None
- Stop bit: 1

C.2.2.1 Passwords

The SAILOR 900 VSAT ACU will log in to the modem using root and user passwords. The default passwords are:

- Root: P@55w0rd!
- User: iDirect

C.2.2.2 Supported commands

After login to the modem the ACU will issue commands to the modem every second. The following commands are supported by the SAILOR 900 ACU:

- rx snr
- options show FREQ_TRANS
- rx freq
- tx freq
- latlong <lat> <long>

The signal strength command: rx snr is issued every 2 seconds. The rest of the commands are issued one by one every 2 seconds between each signal strength command. Meaning each of the other commands is issued every 8 seconds.

The signal strength in the ACU display and web interface is shown as dB., e.g: 8.5 dB. The minimum value for Internet connection is around 2-3 dB.

C.2.2.3 VSAT modem option file

The option file of the VSAT modem must also include the following information:

Section in option file	Description
Satellite information	Receive frequency of the transponder. Used with “rx freq” command Transmit frequency if known otherwise just a dummy tx frequency (e.g. 1.000 MHz). Used with “tx freq” command.
SAILOR 900 VSAT information	<p>The modem provides RX and TX frequency information via a data connection to the SAILOR 900 VSAT.</p> <p>The single-cable solution makes it possible to configure the VSAT modem to use any LO frequency in the range from 9.6 GHz to 11.3 GHz. The SAILOR 900 VSAT will tune to the correct Ku-Band frequency and provide the correct L-Band frequency to the VSAT modem.</p> <p>The SAILOR 900 VSAT has an extended 8 Watt BUC with LO up conversion frequency of 12.8 GHz.</p>

Table C-5: Requirements for VSAT modem option file, Non-OpenAMIP

Section in option file	Description
GPS	The iDirect modem must be set to mobile unit and receive the GPS information from the ACU with the command “latlong <lat> <long>”. Tx handshake must be disabled in the iDirect modem.
Rx 10 MHz	The SAILOR 900 VSAT can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem. See also <i>VSAT modem profile – New entry and Edit</i> on page 6-24.
Tx 10 MHz	The SAILOR 900 VSAT needs the Tx 10 MHz reference signal in order to allow TX ON.

Table C-5: Requirements for VSAT modem option file, Non-OpenAMIP

C.2.3 Configuration examples (Non-OpenAMIP)

Examples of modem profile and satellite configuration from the ACU web MMI are shown in the figures below.

EDIT VSAT MODEM PROFILE

Profile name: X5 (non-OpenAMIP)

VSAT modem: iDirect Evolution X5 Series

This modem profile is used on: 1 satellite profile

VSAT modem root password: P@55w0rd!

VSAT modem user password: iDirect

OpenAMIP IP address: 0.0.0.0

OpenAMIP port: 0

Apply Cancel

Figure C-9: VSAT modem profile, Non-OpenAMIP (example)

EDIT SATELLITE PROFILE

Satellite profile name

VSAT modem profile

Satellite position °

Polarisation skew °

Maximum inclination °

RX polarisation ☒ Horizontal ☐ Vertical

TX polarisation ☐ Co-pol ☒ X-pol

Tracking

RX frequency ☒ VSAT modem ☐ User defined

GHz

☐ DVB-S / DVB-S2

Symbol rate MS/s

NID

☐ DVB power

☒ Narrow band

☐ VSAT modem RSSI

Figure C-10: Satellite profile, Non-OpenAMIP (example)

C.3 Comtech 570L, ROSS box & ACU

C.3.1 Protocols and interfaces

The following sections describe how to connect an ACU, a Comtech570L VSAT modem, a ROSS box and an Ethernet switch.

The SAILOR 900 VSAT software version 1.30 supports Comtech ROSS ROAM protocol 1+ which includes the satellite longitude in the responses from the ACU to the ROSS box. 1.30 also supports setting inclined orbit by entering user defined data.

C.3.1.1 Connections

Connect the ACU and Comtech 570L, ROSS box and Ethernet switch with the following cables:

- Ethernet cables for TCP/IP data communication (x3)
- RS-232 console cable
- 75 Ohm RF cables F-F connectors for rx and tx frequencies.

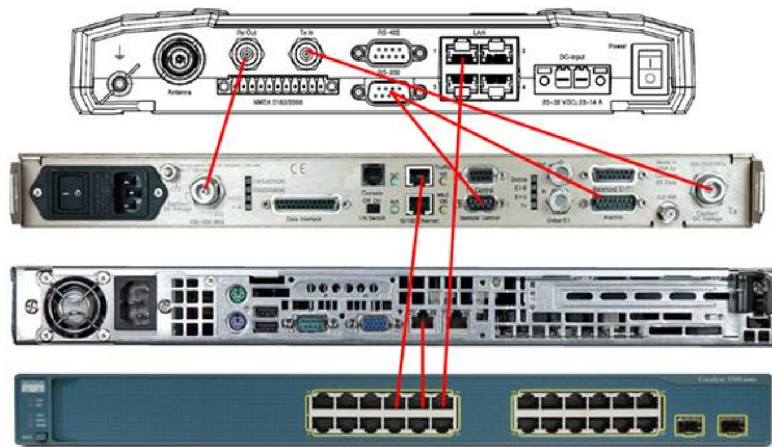


Figure C-11: Connecting Comtech 570L and ROSS box to the ACU (example)

See also *Connecting a Satlink2900 VSAT modem* on page 4-11 and cable specifications at *Modem Cable Comtech Serial & RSSI TT7016A* on page B-2.

C.4 STM SatLink 2900 VSAT modem

C.4.1 Interfaces and VSAT modem configuration

The following sections describe how to connect an ACU to an STM SatLink 2900 VSAT modem. The STM SatLink 2900 and the SAILOR 900 VSAT are fully integrated and require almost no user setup.

STM SatLink 2900 software version required: 14.2.0 or higher.

C.4.1.1 Connections

Connect the ACU and STM SatLink 2900 with the following cables:

- Ethernet cable for TCP/IP data communication. Connect LAN A on the VSAT modem to LAN 1 on the ACU.
- 75 Ohm RF cables F-F connectors for RX and TX frequencies

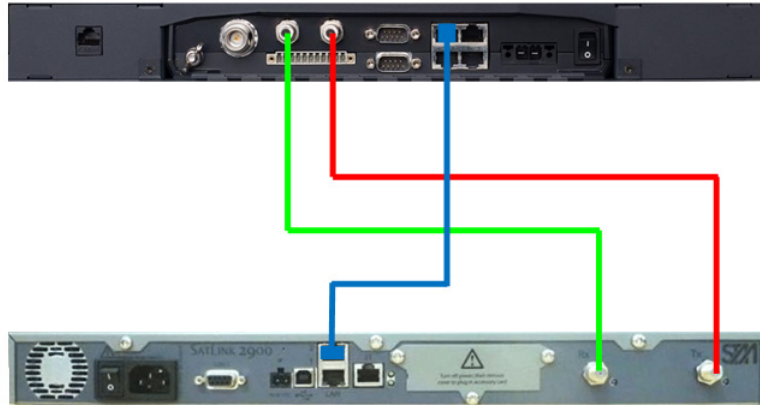


Figure C-12: Connecting SatLink 2900 VSAT modem to the ACU

See also *Connecting a Satlink2900 VSAT modem* on page 4-11.

C.4.1.2 Modem configuration requirements

Type the following command in a modem console to set up the STM Satlink 2900 modem to use the SAILOR 900 VSAT:

odu antenna 30

To display the antenna setup for the STM Satlink 2900 modem, type:

odu antctrl show

Example:

```
odu antctrl show
Antenna Controller Configuration
-----
Type                               : Thrane & Thrane
SAILOR 900
Enabled                           : All
IP address                        : 10.110.2.226
Polling frequency                 : 5 sec
Antenna Stability Tries           : 300

Antenna Controller Status
-----
Controller detected               : no
Packets sent                     : 0
Packets received                  : 0
```

C.4.2 ACU configuration

To set up the ACU to work with an STM Satlink 2900 VSAT modem, do as follows:

1. Add a modem profile with the STM Satlink 2900 modem. See *VSAT modem profile – New entry and Edit* on page 6-24.
2. Add a satellite profile using the STM Satlink modem profile just created. See *Satellite profiles – New entry and Edit* on page 6-21.
3. Edit the network settings and input the IP information supplied with the modem. See *Configuring the LAN network* on page 6-29.
4. Activate the satellite profile.

C.5 Gilat SkyEdge II VSAT modem

C.5.1 Interfaces and VSAT modem configuration

The following sections describe how to connect an ACU to a Gilat SkyEdgeII VSAT modem. The Gilat SkyEdge II and the SAILOR 900 VSAT are fully integrated and require only little user setup.

C.5.1.1 Connections

Connect the ACU and Gilat SkyEdge II with the following cables:

- Ethernet cable for TCP/IP data communication. Connect LAN A on the VSAT modem to LAN 1 on the ACU.
- 75 Ohm RF cables F-F connectors for RX and TX frequencies

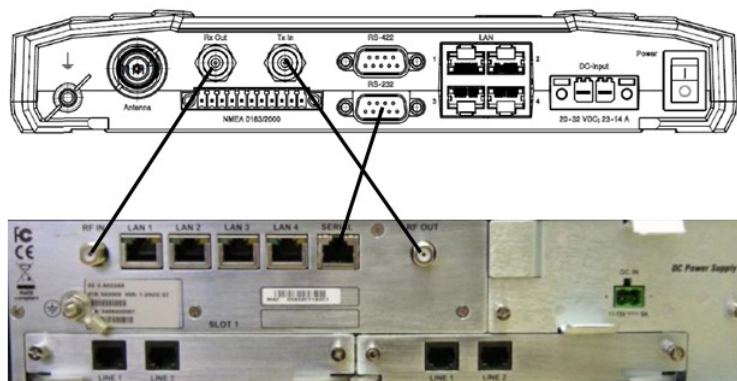


Figure C-13: Connecting Gilat SkyEdge II VSAT modem to the ACU

See also *Connecting a Gilat SkyEdge II VSAT modem* on page 4-12.

C.5.1.2 Modem configuration requirements

1. Connect a PC with an Ethernet cable to LAN port 1 of the VSAT modem.
2. Set the PC to static IP address: 192.168.1.2
3. Start an Internet browser (e.g. Internet Explorer) and go to URL://192.168.1.1 in order to get access to the web server of the VSAT modem.

4. Login with: User name: inst and Password: \$Sat2598\$

5. Go to the menu **Installer**.

Parameter	Settings
RF Downlink frequency	In the section General the RF Downlink frequency is shown. Write it down as it is going to be used for the selection of LNB LO. Further down on the page you find the BUC and LNB LO frequencies.
LNB LO	Depending on the RF Downlink frequency select an appropriate LNB LO of 9.75, 10.25, 10.75 or 11.25 GHz which will result in an L-band frequency between 950 and 1650 MHz which is the operating frequency band of the Sky Edge II Access modem.
BUC LO	Select the BUC to be 12.8 GHz as this is the BUC LO of the SAILOR 900 VSAT. Remember to inform the hub operator about this when doing line up and commissioning.
BUC 10MHz Reference Signal	The BUC 10MHz Reference Signal must be configured to ON, otherwise the SAILOR 900 VSAT will never allow TX. Scroll further down to enable GPS for the Location Coordinates. This enables the serial protocol of the modem so it can communicate with the ACU.

Table C-6: Configuration of Gilat SkyEdge II VSAT modem

6. Go to the top of the page and press the **Submit** button and **OK** to save the new settings.

The VSAT modem is now configured to be used with the SAILOR 900 VSAT.

C.5.2 ACU configuration

To set-up the ACU to work with a Gilat SkyEdge II VSAT modem, do as follows:

1. Add a modem profile with the Gilat SkyEdge II modem. See *VSAT modem profile – New entry and Edit* on page 6-24.
2. Add a satellite profile using the Gilat SkyEdge II modem profile just created. See *Satellite profiles – New entry and Edit* on page 6-21.
3. Edit the network settings and input the IP information supplied with the modem. See *Configuring the LAN network* on page 6-29.
4. Activate the satellite profile.

Command line interface

D.1 Introduction

After you have done the initial configuration and connected the SAILOR 900 VSAT to your network, you can configure the SAILOR 900 VSAT by using Telnet. You can also setup VSAT modem parameters.

```
H:\>telnet 192.168.0.1
acu login: admin
Password:
```

1 Connect to SAILOR 900 using IP address

```
UCLI:/$ config current_list
```

2 Read or change settings

```
UCLI:/$ config activate
```

3 Write new settings to SAILOR 900

Figure D-1: How to use the command line interface (example for telnet)

After successful login you can read and change settings. Use the command **config activate** to activate the new settings in the ACU.

You will need to refresh the browser window before the changed settings become visible.

Note

Every change is performed on the active satellite profile or the active VSAT modem profile.
Parameter identifiers are case sensitive.

D.1.1 Telnet connection

You can access the command line interface via Telnet.

D.1.1.1 User name and password

Access to the SAILOR 900 VSAT system is protected by a user name and password. This is the same user name and password that is used in the web interface under **ADMINISTRATION**, for further details see *Accessing the administration settings (user name, password)* on page 6-43.

D.1.1.2 Telnet

The interface is on the standard Telnet port 23. Use any LAN port and corresponding IP address of the ACU.

To start telnet session do as follows:

1. Open a Telnet client of your choice.
2. At the prompt, enter the IP address of the ACU, user name (admin) and password (1234).

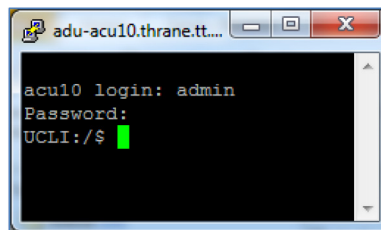


Figure D-2: Command line interface, login

D.1.2 Help

If you enter **help** directly at the prompt **UCLI : /\$** all available commands are listed. Additionally any command will take **help** as first argument and display detailed information of the specific command.

D.1.3 Conventions

The command description below uses the following special typography:

Convention	Description
Courier font	Information that is displayed on the screen.
Bold Courier font	Text the user must enter.
<argument>	Required argument
[argument]	Optional argument

Table D-1: Command typography

Example: satellite lon [longitude]
 zone <id> active <yes | no>

D.2 Supported commands

The following commands are described in detail. They are listed in alphabetical order.

- *config*
- *demo*
- *dual_antenna*
- *exit*
- *help*
- *modem*
- *satellite*
- *status*
- *system*
- *track*
- *zone*

D.2.1 config

Command	Description
config	Shows the sub commands available, including a short description.
config pending_list	Shows the number of pending changes.
config current_list	Shows the values for the current satellite profile, antenna and some tracking information.
config activate	Use this command to save and activate the pending changes in the SAILOR 900 VSAT.

Table D-2: UCLI command: *config*

D.2.2 demo

Command	Description
demo start	Starts a demo pattern where the antenna will turn azimuth, elevation and cross elevation until it receives the command demo stop .

Table D-3: UCLI command: *demo*

Command	Description
<code>demo stop</code>	Stops the antenna demo pattern.
<code>demo reset</code>	Resets the antenna to angle 0.

Table D-3: UCLI command: `demo`

D.2.3 dual_antenna

Command	Description
<code>dual_antenna mode</code>	Shows the current dual antenna mode <ul style="list-style-type: none"> • single • master • slave
<code>dual_antenna status</code>	<ul style="list-style-type: none"> • Shows the current dual-antenna mode status • active • inactive

Table D-4: UCLI command: `dual_antenna`

D.2.4 exit

Command	Description
<code>exit</code>	Exits the connection to the SAILOR 900 VSAT.

Table D-5: UCLI command: `exit`

D.2.5 help

Command	Description
<code>help</code>	Shows a list of commands available, including a short description.
<code>help satellite</code>	Shows the sub commands and description for the command <code>satellite</code> .
<code>help modem</code>	Shows the sub commands and a short description for the command <code>modem</code> .

Table D-6: UCLI command: `help`

Command	Description
help track	Shows the sub commands and description for the command <code>track</code> .
help status	Shows the sub commands and description for the command <code>status</code> .
help system	Shows the sub commands and a short description for the command <code>system</code> .
help config	Shows the sub commands, unit and description for the command <code>config</code> .
help zone	Shows the sub commands, unit and description for the command <code>zone</code> .

Table D-6: UCLI command: **help** (Continued)

D.2.6 modem

Command	Description
modem	Shows a list of sub commands available, including a short description.
modem name	Shows the VSAT modem name of the currently active satellite profile (entered in the web interface).
modem model	Shows the currently active VSAT modem model (selected in the web interface).

Table D-7: UCLI command: **modem**

D.2.7 satellite

Command	Description
satellite name	Shows the name of the currently active satellite profile.
satellite lon satellite lon 1W	Shows or sets the longitude position of the satellite, in degrees. <ul style="list-style-type: none">1.0W or 1.0E or -1.0 for west and 1.0 for east

Table D-8: UCLI command: **satellite**

Command	Description
satellite skew satellite skew 3.7	<p>Shows or sets an additional skew offset of the satellite. Some satellite has additional skew because they have been placed different in the orbit. E.g. Optus satellites in Australia are offset - 45 degrees. Most satellites have 0 degree skew offset.</p> <ul style="list-style-type: none"> Skew of the satellite: -90° to $+90^{\circ}$.
satellite max_inc satellite max_inc 2.5	<p>Shows or sets the maximum inclination of the used satellite. Some satellites are old and are therefore moving in larger circles in space. Setting the maximum inclination will add this to the SAILOR 900 VSAT acquisition window size used to find the satellite.</p> <ul style="list-style-type: none"> Maximum inclination of satellite 0.0° to 90°
satellite rx_pol satellite rx_pol v	<p>Shows or sets the current RX polarisation:</p> <ul style="list-style-type: none"> v (vertical) h (horizontal)
satellite tx_pol satellite tx_pol v	<p>Shows or sets the current RX polarisation:</p> <ul style="list-style-type: none"> v (vertical) h (horizontal)
satellite ele_cut_off satellite ele_cut_off 5	<p>Shows or sets the elevation referenced to earth where the SAILOR 900 VSAT must shut off for transmission. This is an FCC requirement. The elevation cut off depends on how much power is transmitted and which coding is used.</p> <ul style="list-style-type: none"> Valid range: 0° to 90° <p>For further information see <i>Elevation cutoff (in degrees) versus VSAT modem bandwidth and power</i> on page 6-23.</p>
satellite rx_lo	<p>Shows the Rx LO / LNB LO. Range: 9.6 GHz to 11.3 GHz.</p>

Table D-8: UCLI command: **satellite** (Continued)

Command	Description
<pre>satellite rx_rf_freq</pre> <pre>satellite rx_rf_freq 12.123456 9.75</pre>	<p>Shows or sets the Ku-band rx frequency and LNB Lo frequency.</p> <ul style="list-style-type: none"> RF frequency: 10.7 – 12.75 GHz. LNB Lo frequency: 9.6 GHz – 11.3 GHz. <p>The SAILOR 900 VSAT supports any LNB Lo!</p> <p>Note: Setting the Ku-band rx frequency and LNB Lo automatically configures the L-band rx frequency: $\text{Rx L-band freq} = \text{rx_rf_freq} - \text{LNB Lo}$</p> <p>Example: 1567.890 MHz = 11.567890 GHz – 10 GHz</p>
<pre>satellite rx_if_freq</pre> <pre>satellite rx_if_freq 1200.123 9.75</pre>	<p>Shows or sets the IF rx frequency together with the LNB Lo frequency.</p> <ul style="list-style-type: none"> IF frequency within 950 MHz – 2150 MHz. LNB Lo frequency within 9.6 GHz – 11.3 GHz. <p>The SAILOR 900 VSAT supports any LNB Lo!</p> <p>Note: Setting the L-band rx frequency and LNB Lo automatically configures the Ku-band rx frequency: $\text{Rx Ku-band frequency} = \text{LNB Lo} + \text{rx_if_frequency}$</p> <p>Example: 11.567890 GHz = 10 GHz + 1567.890000 MHz</p>
<pre>satellite tx_lo</pre>	<p>Shows the current TX LO frequency, fixed at 12.8 GHz.</p>
<pre>satellite tx_rf_freq</pre> <pre>satellite tx_rf_freq 14.123456</pre>	<p>Shows or sets the Set the RF frequency used for tx.</p> <ul style="list-style-type: none"> Valid range: 13.75 GHz to 14.5 GHz. <p>Note: Configuring the Ku-band tx frequency automatically configures the L-band frequency: $\text{L-band frequency} = \text{Ku-band tx frequency} - 12.8 \text{ GHz (BUC Lo)}$</p> <p>Example: 1308.300000 MHz = 14.108300 GHz – 12.8 GHz</p>

Table D-8: UCLI command: **satellite** (Continued)

Command	Description
<code>satellite tx_if_freq</code>	Shows or sets the Set the IF frequency for tx.
<code>satellite tx_if_freq 1200.123</code>	<ul style="list-style-type: none"> Valid range: 950 MHz to 1700 MHz. <p>Note: Configuring the L-band tx frequency automatically configures the Ku-band frequency: Ku-band frequency = 12.8 GHz (BUC Lo) + L-band frequency</p> <p>Example: 14.108300 GHz = 12.8 GHz + 1308.300000 MHz</p>

Table D-8: UCLI command: **satellite** (Continued)

D.2.8 status

Command	Description
<code>status</code>	Shows the sub commands available, including a short description.
<code>status system</code>	Shows the current status of the SAILOR 900 VSAT. For further information on status values see <i>Information fields on the Dashboard</i> on page 6-19.
<code>status track_all</code>	Shows the current values for all tracking parameters: <ul style="list-style-type: none"> vessel heading azimuth relative elevation relative polarisation skew GPS latitude and longitude
<code>status event_list</code>	Shows a list of active events. For further information on events see <i>System messages</i> on page G-1.

Table D-9: UCLI command: **status**

D.2.9 system

Command	Description
<code>system</code>	Shows the sub commands available, including a short description.

Table D-10: UCLI command: **system**

Command	Description
system restart	Sends a command to the ACU to restart the system instantaneously. It makes a power-on self test and then points to the last used satellite.
system info	Shows the software version, part names and serial numbers of the SAILOR 900 VSAT.

Table D-10: UCLI command: **system**

D.2.10 track

Command	Description
track	Shows the sub commands available, including a short description.
track mode track mode dvb	Shows or sets the receiver bandwidth or mode, the way the SAILOR 900 VSAT tracks the satellite: <ul style="list-style-type: none"> • narrow (recommended, uses the built-in 300 kHz filter of the SAILOR 900 VSAT) • rssi (uses the RSSI signal from the VSAT modem) • wide (uses the wide-band filter to track the satellite) • dvb (uses the built-in DVB-S2 receiver of the SAILOR 900 VSAT to track the satellite. You must configure <code>dvb_sym</code> and <code>dvb_nid</code>.)
track dvb_sym track dvb_sym 22	Shows or sets the current mega symbols rate for the DVB-S2 receiver when in dvb mode. The symbol rate used to verify and track a transponder. <ul style="list-style-type: none"> • Valid range: 0.1 – 99
track dvb_nid track dvb_nid 0	Shows or sets the DVB NID to be verified by the built-in DVB-S2 tracking receiver, when using tracking mode DVB. It configures the NID used to verify and track a transponder. <ul style="list-style-type: none"> • Valid range: 0 – 65535 A NID of '0' disables the NID check. Then the NID will be omitted in the verification of the transponder.

Table D-11: UCLI command: `track`

Command	Description
<code>track rx_rf_freq</code>	<p>The frequency for the receiver to tune to. Verify that the frequency is in the same range as the modem rx_rf frequency, above or below 11.7 GHz. If rx_rf_freq is set to 0, the tracking frequency is the same as the RX frequency provided by the modem</p> <ul style="list-style-type: none"> Valid range: 10.7 GHz to 12.75 GHz.

Table D-11: UCLI command: `track`

D.2.11 zone

Command	Description
<code>zone</code>	Shows the sub commands, unit and description for the command <code>zone</code> .
<code>zone <id> azimuth <start angle> <end angle></code>	<p>Sets the azimuth angles of the blocking zone for one zone.</p> <ul style="list-style-type: none"> Valid zones: 0 to 7 Valid angles: 0 to 360
<code>zone <id> elevation <start angle> <end angle></code>	<p>Sets the elevation angles for a blocking zone.</p> <ul style="list-style-type: none"> Valid zones: 0 to 7 Valid angles: 0 to 360
<code>zone <id> tx_off <yes no></code>	Enables or disables TX inside the blocking zone.
<code>zone <id> active <yes no></code>	Enables or disables the blocking zone.
<code>zone <id></code>	Shows the setting for the blocking zone.

Table D-12: UCLI command: `zone`

DVB-S satellites

This appendix contains examples of DVB-S satellite data for azimuth calibration of the SAILOR 900 VSAT.







VSAT coverage	Satellite name	Satellite position	RX polarisation	RX frequency	Symbol rate	NID
Americas 	SatMex6 Transponder Backup	113°W	Horizontal –	12.080 GHz –	25.635 MS/s –	0 –
USA 	Echostar9 Transponder Backup	121°W	Horizontal Vertical	11.943 GHz 12.016 GHz	20.000 MS/s 20.000 MS/s	4106 4106
South East Asia 	NSS6 Transponder Backup	95°E	Horizontal Horizontal	11.676 GHz 12.729 GHz	27.500 MS/s 26.400 MS/s	65535 100
Europe 	Thor 5 T2 Transponder Backup	0.8°W	Horizontal Vertical	11.785 GHz 12.418 GHz	30.000 MS/s 28.000 MS/s	70 70
Europe 	Telstar 11N Transponder	37,5°W	Horizontal	11.658 GHz	5.9 MS/s	0
Europe 	Astra2 Transponder Backup	28.2°E	Horizontal Horizontal	11.623 GHz 12.032 GHz	27.500 MS/s 27.500 MS/s	32 2

Table E-1: Examples of DVB-S satellites for azimuth calibration



VSAT coverage	Satellite name	Satellite position	RX polarisation	RX frequency	Symbol rate	NID
China 	Apstar6	134°E	Horizontal Vertical	12.435 GHz 12.675 GHz	27.500 MS/s 27.500 MS/s	65
	Transponder Backup					65
Australia 	Optus D1	160°E -45°skew	Horizontal Horizontal	12.391 GHz 12.407 GHz	12.600 MS/s 12.600 MS/s	0
	Transponder Backup					0
Singapore	Thaicom 5	78.5°E	Horizontal	12.272 GHz	30.000 MS/s	88
			Vertical	12.313 GHz	30.000 MS/s	1
Singapore	Apstar 2R (Telstar 10) / Apstar 7	76.5°E	Vertical	11.167 GHz	45.000 MS/s	0

Table E-1: Examples of DVB-S satellites for azimuth calibration (Continued)

For satellite data of other regions or transponders see www.lyngsat.com.

Example:




Freq. Tp	Provider Name Channel Name	System Encryption	SR-FEC SID-VPID	ONID-TID APID Lang.	Beam EIRP (dBW) C/N lock	Source Updated
11038 V tp 38	 Canal +	 DVB-S Mediaguard 2 Nagravision 3	22000-5/6	1-1038	 Europe 51 6.5	D Shimoni 111119

Figure E-1: Satellite data, example from www.lyngsat.com

The above transponder has following parameters:

- Frequency: 11.038 GHz
- Polarisation: V-Vertical
- Symbol Rate: 22.000 MS/s
- NID: 1
- Coverage: Europe.

Grounding and RF protection

F.1 Why is grounding required?

F.1.1 Reasons for grounding

Grounding the SAILOR 900 VSAT system is required for at least two reasons:

- Safety: Lightning protection of persons and equipment.
- Protection: ESD (ElectroStatic Discharge) protection of equipment.

F.1.2 Safety

First of all grounding of the system is required for safety reasons. In the event of a lightning strike at the ADU a proper grounding of the system will provide a low resistance path to divert the strike discharge to seawater.

F.1.3 ESD Protection

The ESD protection circuits in the ACU rely on proper grounding of the system in order to work properly. Otherwise sensitive circuits within the ACU might be damaged due to ESD when you are handling the equipment.

F.2 Grounding Recommendations

F.2.1 Grounding the ACU

The ACU should be grounded to the ship/hull. For this purpose you may use a short ADU cable and a grounding kit. Further, the ACU must be grounded at its grounding stud in order to ensure proper grounding if the short ADU cable is disconnected. For further information, see *Grounding the terminal* on page 2-33.

If you use the Extended cable support, make the ground connections through the cable support. You may need to extend the ground plane using copper foil, see the following section.

F.2.1.1 Extending the ground plane

In some cases it may not be possible to access the hull and at the same time place the ACU in a suitable place. A way to insure good grounding and at the same time make it possible to ground the coax cable - is to extend the ship ground plane by means of copper foil. The maximum length of the foil is determined by the width of the foil:

Copper foil 5 cm wide: Max 50 cm
Copper foil 10 cm wide: Max 100 cm
Copper foil 20 cm wide: Max 200 cm

Note

The foil must be at least 0.1 mm thick.

Connect the foil to the hull by plenty of screws or hard-soldering. Run the foil past the place where the short ADU cable is to be

grounded and mount a grounding kit on top of the foil. For details on the jumper cable see *Jumper cable for grounding* on page F-14.

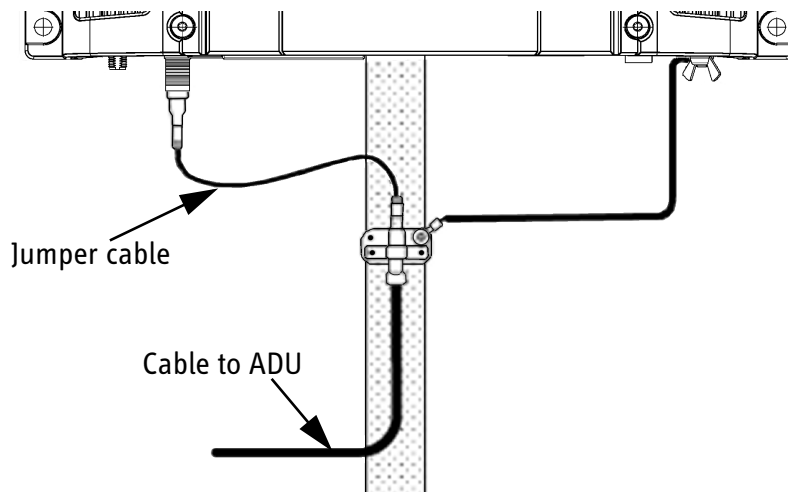


Figure F-1: Extending the ground plane

F.2.2 Grounding the ADU

You can ground the ADU to the ship/hull via one or more of its mounting bolts. Make sure to remove painting, dirt, grease etc. at the mounting holes in order to make good electrical contact to the hull. Use serrated washers when securing the mounting bolts and seal the joint with protective coating to avoid corrosion.

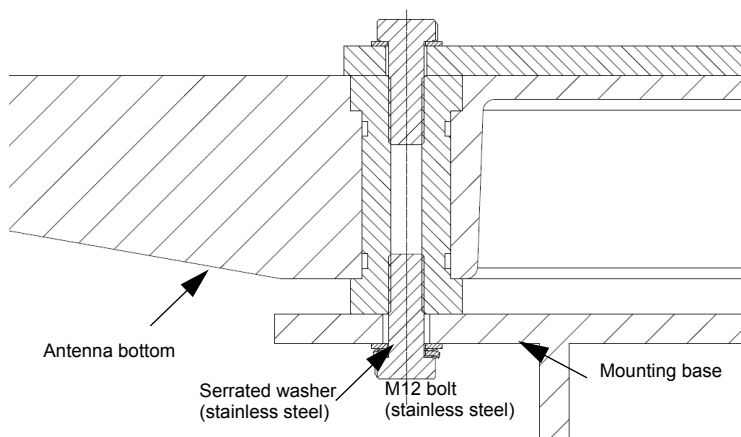


Figure F-2: Grounding the ADU

Note

For optimum grounding use the mounting bolt located closest to the ADU cable plate, see Figure 3-22: *ADU, bolt for optimum grounding* on page 3-22.

It is always recommended to establish the shortest possible grounding path e.g. on steel hulls the ADU should be grounded directly to the hull². However, due to the fact that this is not possible on e.g. fibreglass hulls (nor is it preferable on aluminium hulls) a number of alternative grounding methods are suggested in the following paragraphs.

2. Please note that the ADU ground connection is made at the same electrical ground potential as the ACU.

F.3 Alternative grounding for steel hulls

The following guidelines assume a two-wire, isolated grounding arrangement; that is no part of the circuit, in particular the battery negative, is connected to any ground potential or equipment.

F.3.1 Grounding the ACU

The ACU should preferably be grounded to the ship with the short cable. Further, the ACU must be grounded at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.

The ground connection can be established either at the hull (recommended) or at a dedicated RF ground if available (alternative).

Important However, bear in mind that the ADU ground connection is to be made at the **same electrical ground potential as the ACU** (see *Grounding the ADU*).

The ACU provides galvanic isolation (as required) from its input power terminals to the chassis/grounding stud. This way the isolated grounding arrangement is maintained.

F.3.2 Grounding the ADU

Note For optimum grounding use the mounting bolt located closest to the ADU cable plate, see Figure 3-22: *ADU, bolt for optimum grounding* on page 3-22.

F.3.2.1 Terminal grounded at the hull (recommended)

In this case the ADU is grounded to the ship via one (or more) of its mounting bolts. Make sure to remove painting, dirt, grease etc. at the mounting holes in order to make good electrical contact to the hull. Use serrated washers when securing the mounting bolts and seal the joint with protective coating to avoid corrosion.

F.3.2.2 Terminal grounded at a dedicated RF ground (alternative)

In this case the ADU is grounded with a separate ground cable. The ground cable must be routed parallel and close to the shielded coax cable connecting the ADU to the ACU grounding kit. A heavy gauge wire with tinned strands (min. 6 mm²) can be used for this purpose.

Note

The ADU must be electrically isolated at its mounting bolts by means of shoulder bushings and washers ensuring the isolated RF ground - see *Isolation of the ADU from the mounting base* on page F-12.

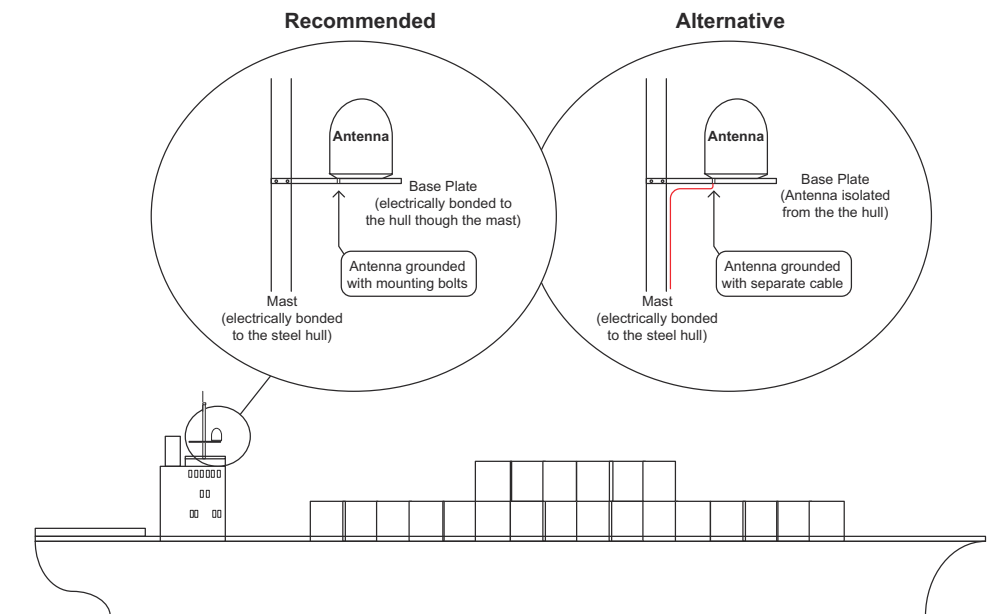


Figure F-3: Grounding at a dedicated RF ground (alternative)

F.4 Alternative grounding for aluminum hulls

The following guidelines assume a two-wire, isolated grounding arrangement; that is no part of the circuit, in particular the battery negative, is connected to any ground potential or equipment.

F.4.1 Grounding the ACU

The ACU should preferably be grounded with the short cable. Further, the ACU must be grounded at its grounding stud to ensure a proper grounding if the short ADU cable is disconnected.

The ground connection must be established at a dedicated RF ground (either capacitively or electrically coupled).

Important Remember to make the ADU ground connection at the **same electrical ground potential** as the ACU (see *Grounding the ADU*).

The ACU provides galvanic isolation (as required) from its input power terminals to the chassis/grounding stud. This way the isolated grounding arrangement is maintained.

F.4.2 Grounding the ADU

If the mounting base of the ADU is electrically connected to the hull (or any other ground potential than the ACU), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers, see F.6.3. This is done in order to prevent DC currents flowing in the hull thus causing electrolytic corrosion.

However, a ground connection must be established via one of the mounting bolts using a separate ground cable. The ground cable must be routed parallel and in close proximity to the shielded coax cable hence connecting the ADU to the ACU Grounding kit. A heavy gauge wire with tinned strands (min. 6 mm²) can be used for this purpose.

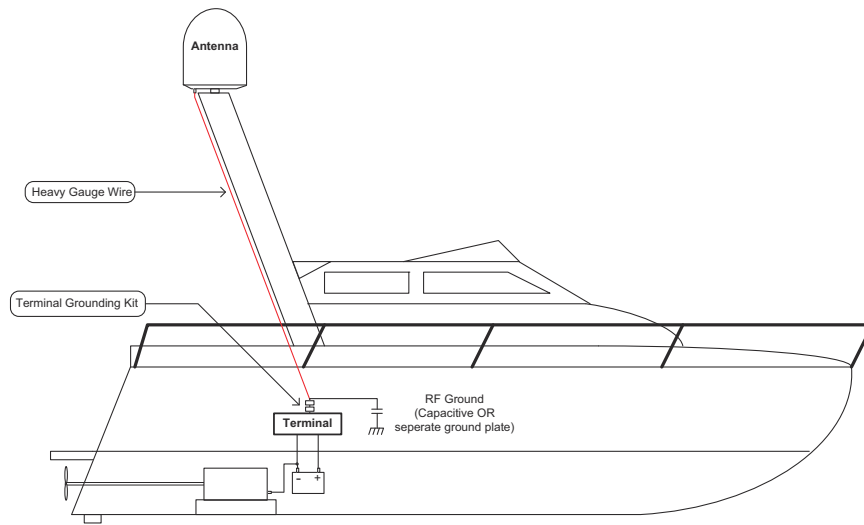


Figure F-4: Alternative grounding for aluminium hulls

F.5 Alternative grounding for fibre glass hulls

F.5.1 Grounding the ACU

The ACU should preferably be grounded with the short ADU cable and a grounding kit (available from Thrane & Thrane). Further, the ACU must be grounded at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.

The ground connection must be established at a dedicated RF ground (either capacitive or electrical coupled).

Important Bear in mind that the ADU ground connection is to be made at the **same electrical ground potential** as the ACU (see *Grounding the ADU*).

F.5.2 Grounding the ADU

If the mounting base of the ADU is electrically connected to any other ground potential than the ACU (e.g. Lightning Ground), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers - see section F.6.3.

However, a ground connection must be established via one of the mounting bolts using a separate ground cable. The ground cable must be routed parallel and in close proximity to the shielded coax cable hence connecting the ADU to the ACU Grounding kit. A heavy gauge wire with tinned strands (min. 6 mm²) can be used for this purpose.

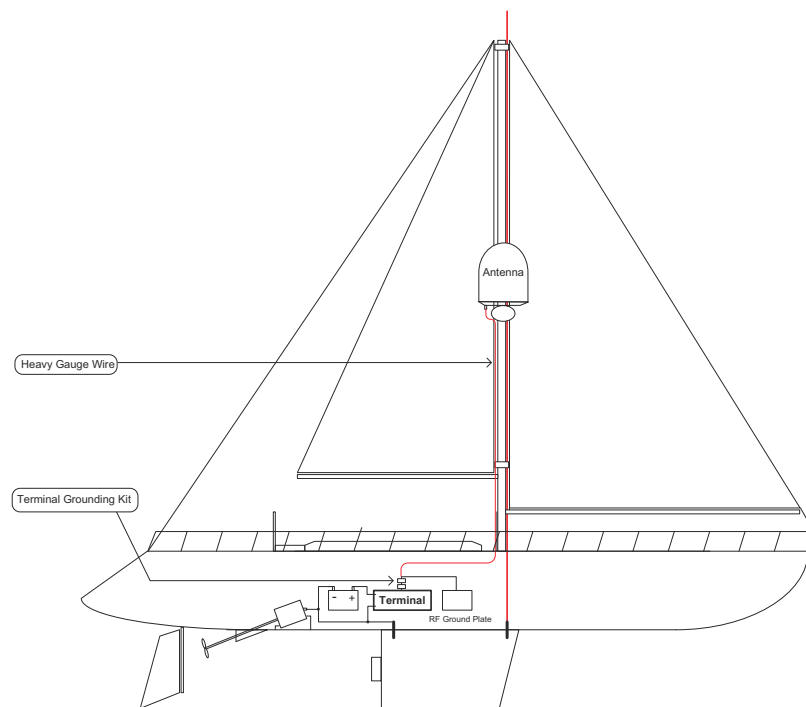


Figure F-5: Alternative grounding for fibreglass hulls

F.6 Separate ground cable

F.6.1 Ground cable - construction

When dealing with electrical installations in a marine environment, all wiring must be done with double insulated, tinned strands, high quality and if exposed also UV resistant cables. This shall also apply to the separate ground cable mentioned in the previous paragraphs.

The ground cable is constructed using an appropriate cable with a cross section area of at least 6 mm² (AWG10) and terminated with insulated ring crimp terminals – see illustration below. The crimp terminals must be a marine approved type e.g. the DuraSeal series from Raychem.

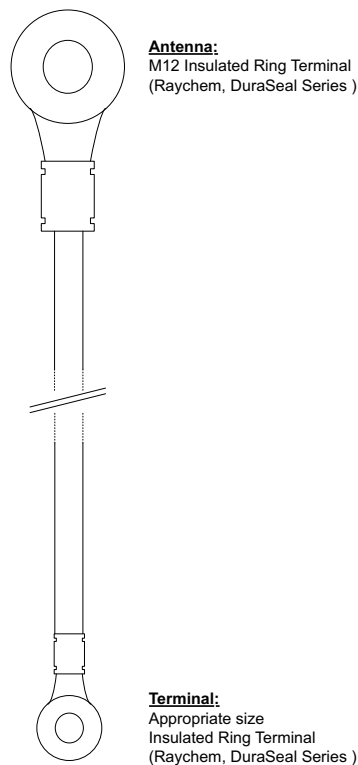


Figure F-6: Separate ground cable

F.6.2 Ground cable - connection

Mount the ground cable close to and parallel to the shielded coax cable thus minimizing ground loop problems. If possible, route the coax cable and the ground cable in metal conduits bonded to the hull or within a mast (depending on the actual installation).

The ground cable must be connected at one of the mounting/grounding bolts on the ADU. Use bolts and washers of stainless steel and seal the joint with protective coating to avoid corrosion. If the ADU is to be isolated from the mounting base, shoulder bushings and washers must be used – see figure F-7, *Isolation of the ADU from the mounting base* on page F-12.

At the other end, connect the ground cable as described in *Grounding the ACU* on page F-2.

F.6.3 Isolation of the ADU from the mounting base

In cases where the ADU is to be isolated from the mounting base, shoulder bushings and washers (accessories) must be used as illustrated below. Please note that the isolation has to be implemented on all four mounting bolts (including the bolt securing the ground cable).

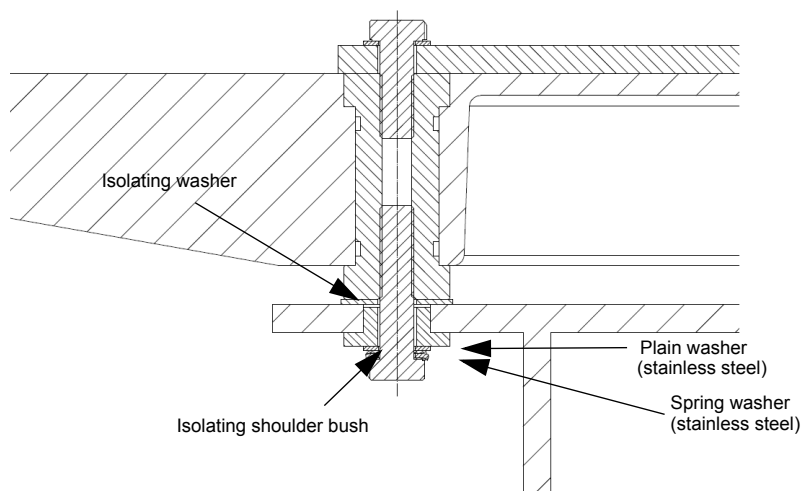


Figure F-7: Isolation of the ADU from the mounting base

The ground cable must be connected at one of the mounting/grounding bolts on the ADU as illustrated below.

Remember to seal the joint with protective coating to avoid corrosion.

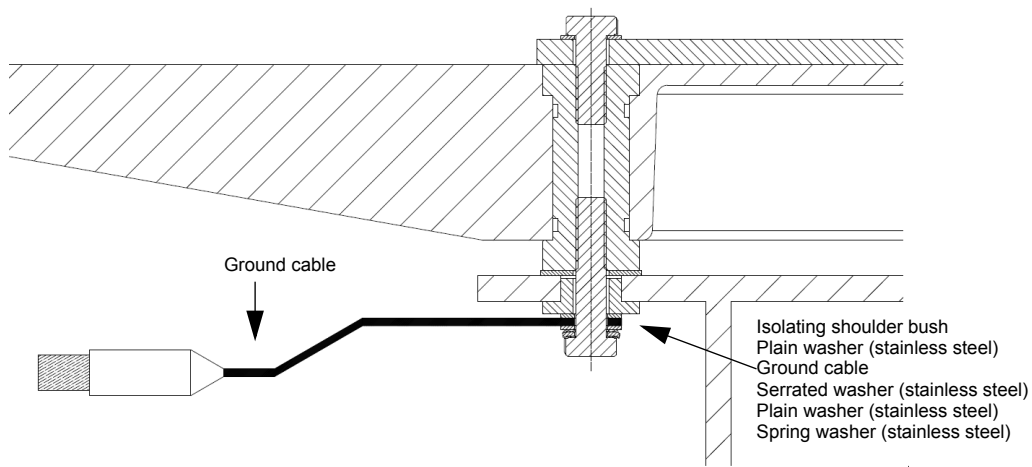


Figure F-8: ADU isolation and grounding cable

F.7 Jumper cable for grounding

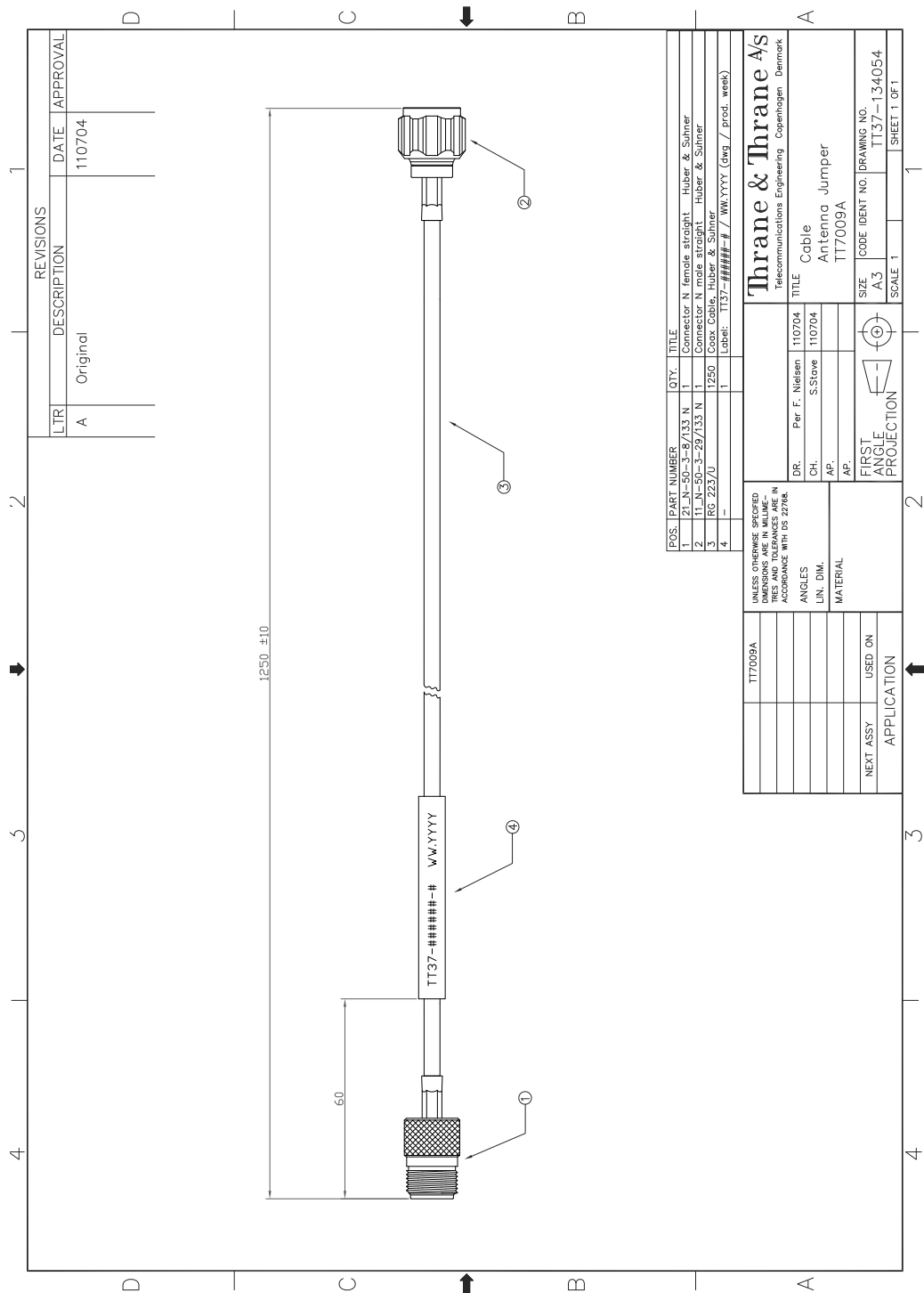


Figure F-9: Jumper cable for grounding (specifications)

F.8 RF interference

Interference induced from nearby high-power RF transmitters might cause system failures and in extreme cases permanent damage to the SAILOR 900 VSAT equipment. If there are problems with interference from HF transmitters, it is advisable to mount ferrite clamps on the coax cable in order to provide suppression of induced RF. The ferrites will have no effect on the differential-mode signals but increases the impedance in relation to common-mode RFI.

F.8.1 Recommendations

Use 1-5 pcs. hinged clamp cores (e.g. the RFC or SFC series from Kitagawa) mounted on the ADU cable near the ADU.

System messages

G.1 Event messages – overview

The SAILOR 900 VSAT detects events during

- POST (Power On Self Test) – a self test performed at every power-up.
- PAST (Person Activated Self test) – started in the web interface
- CM (Continuous Monitoring) – automatically performed while the system is in operation.

When the SAILOR 900 VSAT detects an event that requires your action, it issues an event message and the red Fail/Pass LED in the LED panel of the ACU is lit. As long as an event is active, it is shown in the ACU display and the web interface (in HELPDESK > Event list or click the event icon on the DASHBOARD).

Note Active events and notifications are shown. As soon as the event is cleared, it is not displayed any longer. It is then moved to the Notifications section. Notifications are cleared after 24 hours.

State the Event ID when contacting your service partner.

The event description might contain a number of digits in brackets, e.g. (00000005). This is supplemental information and used for service and diagnostics purposes.

G.2 List of ADU events

Error code (ID)	Unit	Severity	Description	Explanation
0A001-0	Antenna	ERROR	Production data	Production data is invalid
0A002-0	Antenna	ERROR	XIM internal	Antenna configuration data stored in the PCM module is invalid
0A003-0	Antenna	ERROR	XIM external	Antenna configuration data stored in the VIM module is invalid
0A004-0	Antenna	ERROR	XIM I/X match	Antenna configuration data stored in the PCM module does not match the configuration data stored in the VIM module
0A005-0	Antenna	ERROR	Antenna type	The configuration antenna type is unsupported or unknown
0A006-0	Antenna	ERROR	PCM FPGA load	The PCM FPGA cannot be initialised and loaded correctly
0A007-0	Antenna	ERROR	VIM FPGA load	The VIM FPGA cannot be initialised and loaded correctly
0A008-0	Antenna	ERROR	XIM production	Production/calibration data stored in the VIM module is invalid
0A00A-0	Antenna	ERROR	GPS initialisation	The GNSS device cannot be initialised. Check cable and GNSS device
0A014-0	Antenna	ERROR	AMB device discovery	Missing one or more of the following devices: ISM, DDM and PMM. Check cables.
0A015-0	Antenna	ERROR	Azi DDM ABS device	Cannot initialise the azimuth DDM info: 0x00000000: Device not found (possible cabling problem) 0x0000bbaa: Device internal error (device should be replaced) aa=status, bb=state
0A016-0	Antenna	ERROR	Xel DDM ABS device	Cannot initialise the cross-elevation DDM info: See POST_ID_PCM_ABS_AZI
0A017-0	Antenna	ERROR	Ele DDM ABS device	Cannot initialise the elevation DDM info: See POST_ID_PCM_ABS_AZI

Table G-1: ADU event messages

Error code (ID)	Unit	Severity	Description	Explanation
0A018-0	Antenna	ERROR	ISM ABS device	Cannot initialise the ISM info: 0x00000000: Device not found (possible cabling problem) 0x000cbbaa: Device internal error (device should be replaced) aa=status, bb=state, c=calibration data error
0A019-0	Antenna	ERROR	PMM ABS device	Cannot initialise the azimuth PMM info: See POST_ID_PCM_ABS_AZI
0A01E-0	Antenna	ERROR	Sensor sanity	Too many invalid values measured by the ISM during initialisation. Check for vibrations or malfunctioning ISM.
0A021-0	Antenna	ERROR	Azi axis calibration	Azimuth axis zero reference not found. Check belt and zero reference module. info: 0x00000001: Timeout (operation did not complete in time) 0x00000010: Encoder or mechanical problem 0x00000020: Zero reference not found 0x00000040: End stop not found
0A022-0	Antenna	ERROR	Xel axis calibration	Cross-elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. info: See POST_ID_PCM_ANT_AZI
0A023-0	Antenna	ERROR	Ele axis calibration	Elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. info: See POST_ID_PCM_ANT_AZI
0A024-0	Antenna	ERROR	Pol axis calibration	Polarisation axis zero reference or end stops not found at expected locations. Check movement of the polarisation unit and the zero reference module. info: See POST_ID_PCM_ANT_AZI

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A025-0	Antenna	ERROR	Antenna calibration	One or more errors occurred during antenna start-up info: 0x00000001: Timeout (calibration did not complete in time) 0x00000010: Azimuth axis 0x00000020: Cross-elevation axis 0x00000040: Elevation axis 0x00000080: Polarisation axis
0A028-0	Antenna	ERROR	Demodulator load	The second receiver demodulator cannot be initialised and loaded correctly
0A029-0	Antenna	ERROR	VIM PLL lock	The PLL on the VIM does not lock.
0A02B-0	Antenna	ERROR	ABS software version	The ABS software version in the antenna is too old to match the hardware requirements. Upgrade to newer/newest software version.
0A034-0	Antenna	WARNING	ACU communication	The communication link between ACU and antenna is down
0A035-0	Antenna	WARNING	ISM data valid	Sensor measurements from the ISM are invalid. This indicates a malfunctioning ISM
0A036-0	Antenna	WARNING	ISM data range	Sensor measurements from the ISM are out of range
0A037-0	Antenna	WARNING	GNSS communication	Lost connection to the GNSS device
0A038-0	Antenna	WARNING	GNSS data range	Received information from the GNSS device which is out of range
0A039-0	Antenna	WARNING	GNSS device warning	Local GNSS device warning
0A03A-0	Antenna	WARNING	GNSS device error	Local GNSS device error
0A03B-0	Antenna	ERROR	Azi DDM shutdown	The azimuth motor control has detected one of the following situations: Extreme temperature, voltage, current or velocity. The motor was then shut down. This is usually a temporary situation and is probably fixed by a restart of the system.
0A03C-0	Antenna	ERROR	Xel DDM shutdown	As Azi DDM shutdown but detected by the cross-elevation motor control.

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A03D-0	Antenna	ERROR	Ele DDM shutdown	As Azi DDM shutdown but detected by the elevation motor control.
0A03E-0	Antenna	ERROR	PMM shutdown	As Azi DDM shutdown but detected by the polarisation motor control.
0A03F-0	Antenna	WARNING	AMB timing	This indicates a busy situation. It may occur during installation procedures. No user interaction is required.
0A040-0	Antenna	WARNING	VIM cable attn	The output power cannot be controlled correctly. Check the Tx chain
0A041-0	Antenna	WARNING	BUC voltage low	The voltage for the BUC is too low probably caused by a malfunctioning VIM or BUC
0A042-0	Antenna	WARNING	BUC voltage high	The voltage for the BUC is too high probably caused by a malfunctioning VIM
0A043-0	Antenna	WARNING	LNB voltage low	The voltage for the LNB is too low probably caused by a malfunctioning VIM or LNB
0A044-0	Antenna	WARNING	LNB voltage high	The voltage for the LNB is too high probably caused by a malfunctioning VIM
0A045-0	Antenna	WARNING	PMM fan	The fan is not working or the tachometer input from the fan is not connected. Check cable and fan.
0A046-0	Antenna	WARNING	OMT temperature	The temperature of the BUC is too high. Check if fan is working.
0A047-0	Antenna	ERROR	VIM PLL lock	The PLL of the VIM is out of lock. Check the 10 MHz reference signal.
0A048-0	Antenna	WARNING	VIM tuner lock	The PLL of the second receiver (DVB) is out of lock. Check the 10 MHz reference signal
0A049-0	Antenna	WARNING	Azi encoder slip	A slip of the azimuth encoder has been detected. No user interaction is required unless this is a permanent situation in which case the belt and encoder of the azimuth axis must be checked

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A04A-0	Antenna	WARNING	Xel encoder slip	A slip of the cross-elevation encoder has been detected. No user interaction is required unless this is a permanent situation in which case the belt and encoder of the cross-elevation axis must be checked
0A04B-0	Antenna	WARNING	Ele encoder slip	A slip of the elevation encoder has been detected. No user interaction is required unless this is a permanent situation in which case the belt and encoder of the elevation axis must be checked
0A04C-0	Antenna	WARNING	Pol encoder slip	A slip of the polarisation encoder has been detected. No user interaction is required unless this is a permanent situation in which case the encoder of the polarisation axis must be checked
0A04D-0	Antenna	WARNING	GNSS position	No position available from the GNSS device or position too old.
0A04E-0	Antenna	WARNING	GNSS velocity	No velocity available from the GNSS device
0A04F-0	Antenna	ERROR	Heading data	Heading information is missing in the antenna
0A050-0	Antenna	ERROR	Azi DDM communication	Communication error between PCM and azimuth DDM. Check cable.
0A051-0	Antenna	ERROR	Xel DDM communication	Communication error between PCM and cross-elevation DDM. Check cable.
0A052-0	Antenna	ERROR	Ele DDM communication	Communication error between PCM and elevation DDM. Check cable.
0A053-0	Antenna	ERROR	ISM communication	Communication error between PCM and ISM. Check cable.
0A054-0	Antenna	ERROR	PMM communication	Communication error between PCM and PMM. Check cable.
0A055-0	Antenna	WARNING	Azi DDM warning	The azimuth motor controller has temporarily observed an unusual situation with regards to temperature, voltage, current or velocity. No user interaction required.

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A056-0	Antenna	WARNING	Xel DDM warning	The cross-elevation motor controller has temporarily observed an unusual situation with regards to temperature, voltage, current or velocity. No user interaction required.
0A057-0	Antenna	WARNING	Ele DDM warning	The elevation motor controller has temporarily observed an unusual situation with regards to temperature, voltage, current or velocity. No user interaction required.
0A058-0	Antenna	WARNING	PMM warning	The polarisation motor controller has temporarily observed an unusual situation with regards to temperature, voltage, current or velocity. No user interaction required.
0A059-0	Antenna	WARNING	Azi cal. limits	Azimuth axis calibration result check limits exceeded. Pointing performance may be degraded. info: 0x00000100: Zero width is low 0x00000200: Zero width is high 0x00000400: Zero slack is high 0x00001000: Friction average is high 0x00002000: Friction peak is high 0x00004000: Friction asymmetry is high Zero width low/high: Zero reference module placement may be incorrect. Zero slack high: Mechanical slack may be too high. Friction average/peak high: Mechanical friction is higher than expected. Friction asymmetry high: Mechanical imbalance may be too high.
0A05A-0	Antenna	WARNING	Xel cal. limits	Cross-elevation axis calibration result check limits exceeded. Pointing performance may be degraded. info: See EV_PCM_CM_AZI_CAL_LIMITS
0A05B-0	Antenna	WARNING	Ele cal. limits	Elevation axis calibration result check limits exceeded. Pointing performance may be degraded. info: See EV_PCM_CM_AZI_CAL_LIMITS
0A05C-0	Antenna	WARNING	Pol cal. limits	Polarisation axis calibration result check limits exceeded. Pointing performance may be degraded. info: See EV_PCM_CM_AZI_CAL_LIMITS

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A05D-0	Antenna	WARNING	ISM warning	The ISM has temporarily observed an unusual situation with regards to temperature or voltage. No user interaction required. If repeated after cool down and reboot, the ISM or cables around it may be defective.
0A05E-0	Antenna	WARNING	Low elevation	The antenna is not allowed to transmit because the elevation is too low.
0A05F-0	Antenna	WARNING	Heading range	Heading data range error. External heading unit supplies unreliable data.

Table G-1: ADU event messages (Continued)

G.3 List of ACU events

Error code (ID)	ACU PCB	Severity	Description	Explanation
08060-0	ADM	WARNING	ADU modem	ACU/ADU communication error detected (framing and parity). If the situation is persistent, check if cable specifications comply (length and attenuation).
08061-0	ADM	WARNING	VMU linux shell password	The specified password (root) for the VSAT modem is not accepted by the modem
08062-0	ADM	WARNING	VMU debug shell password	The specified password (user) for the VSAT modem is not accepted by the modem
08063-0	ADM	ERROR	ADU connection	The ACU has lost connection with the antenna
08064-0	ADM	ERROR	ADM PLL lock	The intermediate frequency PLL is not in lock. Check the 10 MHz reference signal
08065-0	ADM	WARNING	GNSS data	Missing GPS data (fix)
08066-0	ADM	WARNING	Heading data	Missing heading information. Check cable and heading provider device.
08067-0	ADM	ERROR	PCB temperature	ADM temperature too high. The ACU is not equipped with a fan, so make sure environmental specifications comply
08068-0	ADM	ERROR	PSM power	The PSM fails to provide the requested supply voltage
08069-0	ADM	WARNING	Blocking Zone	The antenna has entered a blocking zone
0806A-0	ADM	WARNING	VMU connection	The ACU has lost connection with the VSAT modem
0806B-0	ADM	WARNING	ROSS connection	The ACU has lost connection with the ROSS device
0806C-0	ADM	ERROR	VMU frequency setup	There is a mismatch in the frequency setup. Probably the VSAT modem is not configured correctly to match the requirements of the ACU and antenna. A common mismatch is the absence of Rx or Tx LO parameter in the VSAT modem.

Table G-2: ACU event messages

Error code (ID)	ACU PCB	Severity	Description	Explanation
0806D-0	ADM	ERROR	ADU power	The ADU supply voltage is outside the allowed limits. This could happen if the PSM fails to provide the requested supply voltage or if the voltage difference across the hotswap is unacceptable high.
0806E-0	ADM	ERROR	VMU 10 MHz reference	The VMU 10 MHz Rx or Tx reference signal is not present. Whether this error Rx or Tx reference, depends on the users selection on the modem profile page. Make sure VMU Rx/Tx cable is connected and that the VMU is configured to output the RX/TX 10 MHz reference signal.
0806F-0	ADM	ERROR	ROSS synchronization	The ACU has become out of sync with the ROSS device, most likely because the ACU has been replaced, or the ROSS satellite profile is new. A manual (forced) hand off sequence must be initiated from the ROSS, refer to the ROSS manual for the procedure.
08073-0	ADM	WARNING	Slave connection	The system is configured as a dual antenna master, but no dual mode slave has connected to it. Either disable dual mode from the web mmi or configure a another system as a dual mode slave.
08074-0	ADM	WARNING	Master connection	The system is configured as a dual antenna slave, but it was not possible to connect to the dual mode master. Check that the IP address entered in the modem profile is correct and check that the master and slave systems are physically connected as described in the manual.
08076-0	ADM	WARNING	Incompatible message version	The system is configured as a dual antenna system, but the software versions on master and slave system are different. Ensure that both master and slave has identical software.

Table G-2: ACU event messages (Continued)

Error code (ID)	ACU PCB	Severity	Description	Explanation
08100-0	ADM	ERROR	PSM low voltage (22 V)	The ADM measures a different ADU voltage than expected. If the problem is not solved by a restart, and the PSM is not reporting any errors, the ADM is probably defect.
08101-0	ADM	ERROR	PSM high voltage (48 V)	The ADM measures a different ADU voltage than expected. Check for short circuit of the antenna coax connector. If the problem is not solved by a restart, and the PSM is not reporting any errors, the ADM is probably defective.
08102-0	ADM	ERROR	PSM 5 V power	Internal voltage supply error of the ADM.
08103-0	ADM	ERROR	ADM hotswap	The ACU is not able to supply the correct voltage to the antenna. Check for short circuits in coax cable and the antenna
08104-0	ADM	ERROR	ADU communication	The ACU cannot communicate with the antenna. Check cable and antenna.
08107-0	ADM	ERROR	ADM FPGA load	The ADM FPGA cannot be initialised and loaded
08108-0	ADM	ERROR	TX Power Detector calibration	The Tx power detector calibration is not valid.
08109-0	ADM	ERROR	ADU XIM data	There is a mismatch with the antenna configuration data. Either the PCM or the VIM in the antenna are malfunctioning or one of them has been replaced. In the latter case, please select which is the original device in the web MMI and restart the system.
0810A-0	ADM	ERROR	ADM production data	Production data has been corrupted
0810B-0	ADM	ERROR	ADU software version	Some error occurred during upload of software to the ADU, which means that the ADU software version is not as expected. Either the software in the ACU, does not meet the minimum version required by the ADU, the software image in the ACU is corrupted or the upload procedure failed because of a communication error.

Table G-2: ACU event messages (Continued)

Error code (ID)	ACU PCB	Severity	Description	Explanation
0810C-0	ADM	ERROR	File system integrity	One or more file system partitions are corrupt. You may have lost your settings and collected statistics. If restarting the system does not help, contact your service technician.
09000-0	KDM	ERROR	KDM 3V3 supply	Internal 3V3 voltage supply error in the KDM
09001-0	KDM	ERROR	KDM 12V supply	Internal 12V voltage supply error in the KDM
09002-0	KDM	ERROR	KDM display	Display hardware error in the KDM
09010-0	KDM	ERROR	KDM link/SW version	Link to the KDM module could not be established. Either the KDM board is malfunctioning, or - if the system software has just been updated - the SW is too old and is not compatible with the PSM hardware.
0B000-0	PSM	ERROR	PSM production data	Missing or invalid production data in the PSM. It should be replaced.
0B001-0	PSM	ERROR	NMEA 2000 identifier	Missing or invalid production data in the PSM. It should be replaced.
0B010-0	PSM	ERROR	PSM link/SW version	Link to the PSM module could not be established. Either the PSM board is malfunctioning, or - if the system software has just been updated - the SW is too old and is not compatible with the PSM hardware.
0B060-0	PSM	WARNING	NMEA 0183 parse error	Parse errors detected on the NMEA 0183 interface. Check NMEA 0183 cable, signal levels etc.

Table G-2: ACU event messages (Continued)

Approvals

H.1 Satellite approvals

TBD

H.2 CE (R&TTE)

The SAILOR 900 VSAT is CE certified (R&TTE directive) as stated in the “Declaration of Conformity with R&TTE Directive”, enclosed in copy on the next page.

Thrane & Thrane

Thrane & Thrane A/S

Declaration of Conformity with R&TTE Directive

The undersigned of this letter declares that the following equipment complies with the specifications of EC directive 1999/5/EC concerning Radio & Telecommunications Terminal Equipment.

Equipment included in this declaration

TT-7090A VSAT 900 System consisting of:

TT-7016A	SAILOR 900 Antenna Control Unit (ACU) T19"	PN = 407016A-T19 or
	SAILOR 900 Antenna Control Unit (ACU) TBH	PN = 407016A-TBH or
	S900 Antenna Control Unit (ACU) N19"	PN = 407016A-N19 or
	S900 Antenna Control Unit (ACU) NBH	PN = 407016A-NBH

And:

TT-7009A	SAILOR 900 Above Deck Unit (ADU) THR	PN = 407009A-THR or
	S900 Above Deck Unit (ADU) EDK	PN = 407009A-EDK or
	S900 Above Deck Unit (ADU) NEU	PN = 407009A-NEU

Equipment Applicability

TT-7090A VSAT 900 System consists of an antenna unit (ADU – Above Deck Unit) and an ACU (Antenna Control Unit). The system includes either one of the ACUs (TT-7016A 19" Rack or TT-7016A Bulkhead). VSAT=Very Small Aperture Terminal. It is a system that provides two-way satellite voice/data broadband communication while in movement on a vessel at sea (stabilized). The system can transmit to and receive from any desired Ku-band satellite, which has adequate signal coverage in the current geographic area.

Declaration

The requirement with respect to the LVD directive 2006/95/EC is met by conforming to the harmonized EU standard EN 60950. The protection requirement with respect to the EMC directive 2004/108/EC is met by conforming to the harmonized EU standard EN 60945. Effective use of frequency spectrum is met by conforming to harmonized EU standard EN 302 340. Confirmed by Nemko, Notified Body No. 0470.

Manufacturer

Thrane & Thrane A/S
Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark
Porsvej 2, DK-9200 Aalborg SV, Denmark

Place and Date

Kgs. Lyngby, 24. January 2012



Walther Thygesen, CEO
Thrane & Thrane A/S



Doc. no. 99-133102-A

Thrane & Thrane A/S • Lundtoftegårdsvej 93 D • DK-2800 Kgs. Lyngby • Denmark
T +45 39 55 88 00 • F +45 39 55 88 88 • info@thrane.com • www.thrane.com
Bank: Danske Bank • Comp.reg.: 65 72 46 18 • VAT: DK-20 64 64 46



Page: 1 of 1

A

ABS	ADU Bus Slave
ACU	Antenna Control Unit
ADM	ACU Digital Module. A main processor board in the ACU.
AMB	Antenna Module Bus

B

BUC	Block Up Converter - The BUC can be thought of the “transmitter”, and its actions are effectively the direct opposite to the LNB. The BUC consists of the Up Converter and HPA.
-----	---

C

CE	Conformité Européenne. This term signifies that a CE certified product conforms to European health, environmental, and safety regulations. In short, it makes the product legal to be sold in the European Union.
CM	Continuous Monitoring

D

DDM	DC-Motor Driver Module
DHCP	Dynamic Host Configuration Protocol. A protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network.
DNS	Domain Name System. A system translating server names (URLs) to server addresses.
DVB	Digital Video Broadcasting, a set of standards relating to digital television.

E

EIRP	Effective Isotropically-Radiated Power. The amount of power that would have to be emitted by an isotropic antenna (that evenly distributes power in all directions) to produce the peak power density observed in the direction of maximum antenna gain.
ESD	ElectroStatic Discharge

ETSI European Telecommunication Standard Institute

F

FPGA Field Programmable Gate Array

G

GNSS Global Navigation Satellite System, e.g. GPS.

GPL General Public License

GPS Global Positioning System. A system of satellites, computers, and receivers that is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from different satellites to reach the receiver.

H

HDT HeaDing True, NMEA sentence.

I

IEC International Electrotechnical Commission. The international standards and conformity assessment body for all fields of electrotechnology.

ISM Inertial Sensor Module

K

KDM Keyboard and Display Module of the ACU

L

LAN Local Area Network

LEN Load Equivalent Number

LGPL Lesser General Public License

LNB Low Noise Block. A device used to amplify or boost the weak received signal without amplifying the noise signals (hence the “low noise” part of LNB) and to convert the high frequencies of the signal into lower frequencies, a process called down converting, for conveyance to the indoor equipment (demodulator) for processing.

LO Local Oscillator. LO frequency used by BUC and LNB.

M

MIB Management Information Base

N

NID Network IDentification

NMEA National Marine Electronics Association (standard). A combined electrical and data specification for communication between marine electronic devices such as echo sounder, sonars, anemometer (wind speed and direction), gyrocompass, autopilot, GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the U.S.-based National Marine Electronics Association.

O

OMT Ortho Mode Transducer

openAMIP Open Antenna-Modem Interface Protocol, facilitates the exchange of information between an ACU and a satellite router. It allows the router to command the antenna and enables automatic beam switching (ABS).

ORE Optical Reference Encoder

P

PAST Person Activated Self Test

PCM Pedestal Control Module

PMM Polarisation Motor Module

POST Power On Self Test. A system test that is activated each time the system is powered on.

PSM Power Supply Module

R

RF Radio Frequency. Electromagnetic wave frequencies between about 3 kilohertz and about 300 gigahertz including the frequencies used for communications signals (radio, television, cell-phone and satellite transmissions) or radar signals.

RFI Radio Frequency Interference. A non-desired radio signal which creates noise or dropouts in the wireless system or noise in a sound system.

ROSS Roaming Oceanic Satellite Server

RSSI Received Signal Strength Indicator

S

SNMP Simple Network Management Protocol. An Internet-standard protocol for managing devices on IP networks. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention.

U

UCLI User Command Line Interface

V

VIM VSAT Interface Module

VMU VSAT Modem Unit

VSAT Very Small Aperture Terminal, a two-way satellite ground station or a stabilized maritime VSAT antenna with a dish antenna that is smaller than 3 metres.

W

WAN Wide Area Network

X

XIM Xim Interface Module, term for the module that connects the PCM and the ACU. X stands for one of various interface modules.

Z

ZRM Zero Reference Module

Numerics

10 MHz reference, 6-25

A

access

limit, 6-45

ACU

description, 2-8

LED, 9-8

ACU (bulkhead)

grounding, 3-27

installing, 3-26

ACU bulkhead

connector panel, overview, 4-2

LEDs, display and keypad, 4-1

ACU display

description, 6-49

ACU events, G-9

ACU interfaces, 2-8

ACU menus

quick guide, 8-2

ACU rack version

connector panel, overview, 4-2

grounding, 3-31

installing, 3-30

LEDs, display and keypad, 4-1

administration

settings, 6-43

administrator

log off, 6-45

login, command line interface, D-2

login, web interface, 6-43

password, 6-43

password, change, 6-44

password, reset, 6-44

ADU

cable sizes, A-9

connector, 4-4

description, 2-4

grounding, optimal, 3-23

ADU cable

alternatives, 3-25

connection, 3-21

modem attenuation, 3-25

ADU cable loop

DC-resistance, 3-25

ADU events, G-2

aluminum hulls

grounding, F-7

antenna

drainage, 3-17

grounding recommendations, F-3

installation location, 3-3

isolation from mounting base, F-12

mast design, 3-8

obstructions, 3-4

opening, 3-22

radiation, 3-6

stabilization, 2-4

antenna dish position

fix, 2-6, 9-15

Apstar, E-2

Astra2 satellite, E-1

attenuation

ADU cable, 3-25

Australia satellite, E-2

azimuth calibration, 6-4

DVB symbol rate minimum, 6-5

B

baud rate

NMEA 0183, 4-5

VSAT modem, 6-25

beam switching, C-2

BITE test, 9-8

block diagram, 9-94

blocking zones

azimuth, 3-5

elevation, 3-5

braces

mast, 2 pieces, 3-12

mast, 3 pieces, 3-11

browser settings
for web interface, 6-17

BUC
troubleshooting, 9-92

BUC data sheet, A-12

BUC LO frequency, A-12

BUC power, 6-13

C

cable

calibration data reset, 6-48
Comtech 570 L or 625 Satellite Modem, 4-10, 4-11, 4-12
ground, F-11
iNFINITI 5000 Series Satellite Router, 4-9
power, 5-2
RS-232 to Console, 4-9

cable loss

ADU cable, 3-22

cable requirements

NMEA, 4-5

cable size

N-connector, ADU, A-9

cable support

ACU (bulkhead), 3-28

cable type

LAN, 4-8

calibration

azimuth, 6-4, 6-7

cable, 6-7

elevation requirements, 6-5

error codes, 6-9

flow chart, 6-10

NID, 6-5

polarisation, 6-5

satellite data, 6-5, 6-8, 6-22, E-1

service profile, 6-4

calibration data, 6-48

enter, 6-4

reset, 6-48

update, 9-89

change administrator password, 6-44

Change network, 6-46

China satellite, E-2

command line interface, D-1

config, D-4

demo, D-4

dualantenna, D-5

exit, D-5

help, D-2

modem, D-6

satellite, D-6

status, D-9

supported commands, D-4

system, D-9

track, D-10

user name and password, D-2

zone, D-11

commands in command line interface, D-4

compass safe distance, A-4

Comtech 570 L or 625 Satellite Modem, 4-10, 4-11, 4-12

cable, 4-10, 4-11, 4-12

condensation in antenna, 3-17

config

command line interface, D-4

configuration

copy, 6-46

export, 6-46

import, 6-46

LAN network, 6-29

site map, 6-14

step-by-step, 6-2

configuration examples

Non-OpenAMIP, C-12

OpenAMIP, C-8

Configuration program, 6-1

connect

Comtech 570 L or 625 Satellite Modem, 4-10, 4-11, 4-12

Evolution X5 Satellite Router, 4-10

iNFINITI 5000 Series Satellite Router, 4-9

power cable, 5-4

web interface, 6-2

- connector
 - ADU, 4-4
 - DC, 4-3
 - DC Input, 4-3
 - LAN, 4-7
 - management PC, 4-7
 - modem control, 4-7
 - NMEA 0183/2000, 4-5
 - RS-232, 4-6
 - RS-422, 4-6
 - service port, 4-7
 - TNC, 4-4
 - VMU Rx-Tx, 4-4, 4-5
- contact information, 9-2
- corrosion
 - smoke deposits, 3-17
- country restrictions
 - VSAT, -v
- current
 - start up peak, 5-1

D

- daily use, 8-1
- DC connector, 4-3
- DC Input
 - connector, 4-3
- default
 - reset to factory settings, 6-48
- default gateway, 6-31
- degradation
 - due to the radar, 3-15
 - Ku-band connection, 3-15
- demo
 - command line interface, D-4
- DHCP client, 6-30
- DHCP server, 6-30, 6-31
- diagnostic report, 6-36, 9-2
- display
 - ACU, description, 6-49
- distance
 - antenna to GPS receiver, 3-16
 - antenna to radar, 3-13
- DNS setup, 6-31
- drainage of antenna, 3-17

- drawing
 - ACU bulkhead, A-7
 - ACU rack version, A-8
 - ADU, A-6
- dual antenna
 - blocking zone, 6-41
 - cabling, 3-34
 - command line interface, D-5
 - commissioning, 6-42
 - configuration, 6-37
 - installation, 3-33
 - line up, 6-42
- dual-antenna mode
 - slave DASHBOARD, 6-37
- DVB symbol rate
 - azimuth calibration, 6-5
- DVB-S, 6-5
- DVB-S satellite data, E-1
- DVB-S2, 6-5

E

- elevation angle
 - minimum, 6-23
- elevation cutoff, 6-23
- E-mail setup, 6-32
- error codes, G-1
 - calibration, 6-9
- error messages, 9-3, G-1
 - ACU, G-9
 - ADU, G-2
- ETSI
 - elevation angle, 6-23
- event, G-1
- events
 - ACU, G-9
 - ADU, G-2
 - list of active, 9-3
- Evolution X5 Satellite Router
 - connect, 4-10
- exit
 - command line interface, D-5
- export configuration, 6-46

F

- factory default
 - calibration data, 6-48
 - reset, 6-48
- factory defaults
 - reset to, 9-4
- failure states
 - view, 9-91
- FCC
 - elevation angle, 6-23
- Features, 2-3
- fiberglass hulls
 - grounding, F-9
- fix antenna
 - lock, 2-6, 9-15
- fixed heading, 6-7
- fixed TX gain, 6-13
- flange thickness, 3-8
- flatness, 3-8
- flow chart
 - calibration, 6-10

G

- gain
 - fixed TX, 6-13
- gateway setup, 6-31
- GPS receiver
 - distance from antenna, 3-16
- grounding, F-1
 - ACU (bulkhead), 3-27
 - ACU rack version, 3-31
 - ADU, 3-23
 - aluminum hulls, F-7
 - antenna, F-3
 - cable, F-11
 - fiberglass hulls, F-9
 - recommendations, F-2
 - steel hulls, F-5
 - terminal, F-2
- gusset plates, 3-8

H

- hatch
 - remove, 3-22
- help
 - command line interface, D-2
- helpdesk number, 9-2
 - changing in web interface, 9-2
- humidity in antenna, 3-17

I

- impedance
 - cable, 5-3
 - ship, 5-2
 - total, 5-2
- import configuration, 6-46
- iNFINITI 5000 Series Satellite Router
 - cable, 4-9
 - connect, 4-9
- installation
 - ACU (bulkhead), 3-26
 - ACU rack versionl, 3-30
- Interfaces, 4-1, 5-1
- interference, 3-13
 - from radar, 3-13
 - RF, F-15
- IP address
 - for web interface, 6-2, 9-5
 - OpenAMIP modem, 6-25, 6-30
 - static, 6-30

L

- LAN
 - cable type, 4-8
 - connector, 4-7
 - network setup, 6-29
- LAN configuration
 - default gateway, 6-31
 - DHCP client, 6-30
- LAN connector
 - management, 4-7
- LAN network
 - configuration, 6-29

LED
 ACU, 9-8
 license
 software, -ii
 limit access to web interface, 6-45
 Line up, 6-11
 LNB
 configuration, A-10
 data sheet, A-10
 LO frequency, A-10
 troubleshooting, 9-93
 LO frequency, A-10, A-12
 load
 configuration, 6-46
 lock
 service hatch, 3-22
 locking pin, 2-6, 9-15
 log off
 administrator, 6-45
 logon
 administrator, command line interface, D-2
 administrator, web interface, 6-43

M

mail server
 setup, 6-32
 management PC
 connect, 4-7
 mast
 2 braces, 3-12
 3 braces, 3-11
 design, 3-8
 flange thickness, 3-8
 flatness, 3-8
 foundation, 3-8
 gusset plates, 3-8
 height, 3-8
 without braces, 3-11
 mast flange, 3-8
 mast for antenna, 3-8
 mast length, 3-11
 Master ACU
 dual antenna, 6-38
 messages, G-1
 sent from VMU, OpenAMIP, C-4
 MIB, 6-55

MIB file, 6-55
 microwave radiation, -iii
 minimum elevation angle, 6-23
 Model numbers, 2-11
 modem
 command line interface, D-6
 signal level, ACU display, 6-52
 supported types, 6-25
 modem control
 connector, 4-7
 modem option file
 Non-OpenAMIP, C-11
 modify XIM data, 6-46
 motion centre
 ship, 3-7

N

navigation, 6-15
 navigation in web interface, 6-16
 N-connector
 cable sizes, A-9
 network
 LAN setup, 6-29
 NID
 calibration, 6-5
 NMEA
 cable requirements, 4-5
 connector, 4-5
 LEN, 4-5
 NMEA 0183
 baud rate, 4-5
 Non-Open AMIP
 examples, C-12
 setup, C-9
 Non-OpenAMIP
 supported commands, C-11
 notifications, 9-3
 NSS6 satellite, E-1

O

obstructions
 distance and size, 3-4
 On/Off switch
 rack version, 4-2

OpenAMIP
 setup, C-2
 supported commands, C-4
OpenAMIP IP modem
 IP address, 6-25, 6-30
OpenAMIP keys, C-5
opening antenna, 3-22
options
 order number, 2-11
options file, C-5
order number
 options, 2-11
order numbers, 2-11
outline drawing
 ACU bulkhead, A-7
 ACU rack version, A-8
 ADU, A-6

P

password
 administrator, 6-43
 change, 6-44
 UCLI, D-2
PAST, 9-8
peak current, 5-1
permissions
 user, 6-45
Person Activated Self Test, 9-8
placing the antenna, 3-3
polarisation skew, 6-8
pole mount, 3-8
POST, 9-8
power
 sources, 5-1
power cable
 connect, 5-4
 selection, 5-2
Power On Self Test, 9-8
power supply, 2-8
protect access to settings, 6-45
Proxy server, disabling, 6-17

Q

quick guide, 8-1
 ACU menus, 8-2
 web interface, 8-1

R

radar
 distance from antenna, 3-13
 signal degradation, 3-15
radiation, -iii
radiation level, 3-6
reference signal, 10 MHz, 6-25
refresh
 browser, 6-7
 web interface, 6-7
remove
 service hatch, 3-22
report
 send by e-mail, 6-32
reset, 6-55, 9-4
 factory default, 6-48
 password, 6-44
reset administrator password, 6-44
reset keys on ACU, 6-55
RF interference
 recommendations, F-15
RF loss
 ADU cable, maximum, 3-22
ROAM protocol
 ROSS, C-14
roll period
 limitations, 3-7
 mounting height, 3-7
 ship, 3-7
ROSS box, C-14
ROSS ROAM protocol, C-14
RS-232
 connector, 4-6
RS-232 to Console
 cable, 4-9
RS-422
 connector, 4-6
Rx-Tx
 connector, 4-4, 4-5

S

- safety summary, -iii
- samples
 - statistics, 6-33
- sampling interval, 6-33
- satellite
 - Singapore, E-2
- satellite
 - Apstar, E-2
 - Astra2, E-1
 - Australia, E-2
 - China, E-2
 - command line interface, D-6
 - NSS6, E-1
 - SatMex6, E-1
 - SES, E-1
 - Telstar 10, E-2
 - Telstar 11N, E-1
 - Thaicom 5, E-2
 - Thor 5 T2, E-1
- satellite data, E-1, E-2
 - calibration, 6-5, 6-8, 6-22
- SatMex6 satellite, E-1
- save
 - configuration, 6-46
- schematics diagram, 9-94
- self test, 2-7, 9-4
- send e-mail
 - diagnostic report, 6-36
- server setup
 - SMTP, 6-32
- service hatch
 - lock, 3-22
 - remove, 3-22
- service port
 - rack version, 4-2
- service profile
 - calibration, 6-4
- SES satellite, E-1
- setup
 - diagnostic report, 6-36
 - e-mail, 6-32
 - for statistics report, 6-32
 - statistics report, 6-33
 - user permissions, 6-45
- shadowing, 3-4
- ship motion centre, 3-7
- signal level
 - modem, ACU display, 6-52
- Singapore satellite, E-2
- site map, 6-14
- SkyEdge II, C-17
- Slave ACU
 - dual antenna, 6-39
- smoke deposits, 3-17
- SMTP
 - server, 6-32
- SMTP login, 6-32
- SNMP, 6-55
 - community string, 6-55
- software license, -ii
- software update, 9-5
- software version, 1-2, 6-14
 - verify, 9-6
- source impedance
 - measuring, 5-2
- specifications, A-1
 - ACU, A-4
 - ADU, A-2
 - BUC, A-12
 - cable Comtech VSAT modem, B-2
 - cable iDirect VSAT modem, B-3
 - LNB, A-10
- spreadsheet
 - statistics report, 6-35
- start-up current, 5-1
- static IP, 6-2
- static IP address, 6-30
- statistics
 - sampling frequency, 6-33
 - send by e-mail, 6-32
- statistics report, 6-33, 6-34
 - example, 6-35
 - import into spreadsheet application, 6-35
 - setup, 6-33
- status
 - command line interface, D-9
- status messages, 9-8
- steel hulls
 - grounding, F-5
- STM Satlink 2900 VSAT modem
 - setup, C-15, C-17
- support
 - contact information, 9-2

- symbol rate
 - DVB, azimuth calibration, 6-5
- system
 - ACU reset, keys to press, 6-55
 - command line interface, D-9
- system configuration
 - copy, 6-46
- System messages, G-1

T

- technical data, A-1
- Telnet, D-2
- Telstar 10, E-2
- Telstar 11N satellite, E-1
- terminal
 - grounding recommendations, F-2
- Thaicom 5, E-2
- Thor 5 T2 satellite, E-1
- TNC connector, 4-4
- tools needed, 3-3
- track
 - command line interface, D-10
- troubleshooting
 - BUC, 9-92
 - diagnostic report, 9-2
 - LNB, 9-93
- TT number, 2-11
- TX gain
 - fixed, 6-13

U

- update
 - calibration data, 9-89
- updating software, 9-5
- upload
 - configuration, 6-46
- use
 - daily, 8-1
- user name
 - UCLI, D-2
- user permissions, 6-45
 - setup, 6-45

V

- VMU connector, 4-4, 4-5
- VSAT modem
 - baud rate, 6-25
 - Comtech 570 L or 625, 4-10
 - Comtech 570L, C-14
 - Gilat SkyEdge II, C-17
 - Gilat SkyEdge II, cabling, 4-12
 - iDirect iNFINITI, C-9
 - iDirect INFINITI (open AMIP), C-2
 - iNFINITI, cabling, 4-9
 - Satlink2900, cabling, 4-11
 - STM Satlink 2900, C-15, C-17
 - supported types, 6-25
- VSAT modem option file
 - Non-OpenAMIP, C-11
 - OpenAMIP, C-5
- VSAT restrictions, -v

W

- warning messages, G-1
- warnings, 9-3
- web interface
 - browser settings, 6-17
 - connect, 6-2
 - LAN connector, 4-7
 - navigating, 6-16
 - refresh, 6-7
- web mmi
 - LAN connector, 4-7
- Wiring, 4-1, 5-1

X

- XIM, 9-91
- XIM data, 9-89
 - modify, 6-46

Z

- Zeroconf, 6-31
- zone
 - command line interface, D-11

98-133966-E